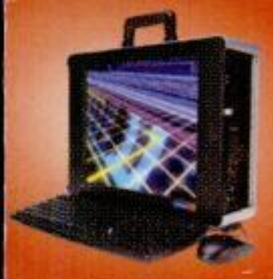

PC Gaming? In a Briefcase?
We brutally review MaxVision's oddball LAN party computer

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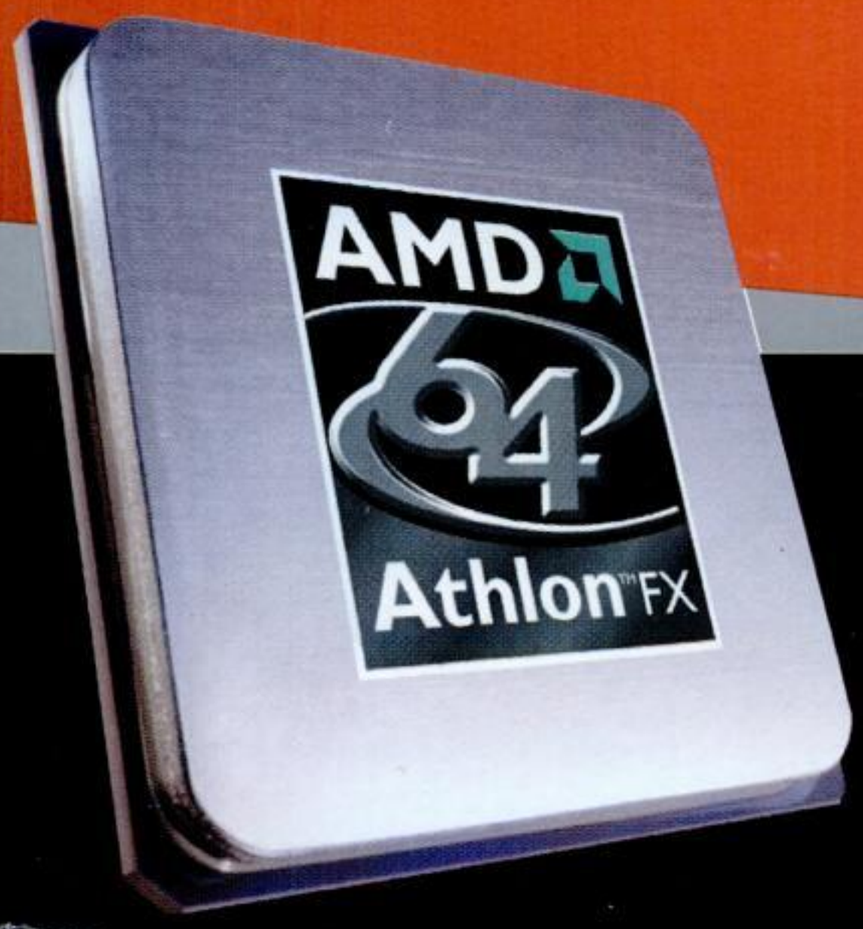

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Release Notes

The Perils of Monthly Publishing

Maximum PC is a monthly magazine, and in theory we have about 20 working days to produce each issue. Why, then, do we have such a royal bitch of a time trying to remain fresh and current? It's the damn PC hardware scene—it's constantly changing, and a single change can have a grave ripple effect throughout our entire scope of coverage.

Take AMD's new Athlon 64 FX processor. It portends to be an amazing CPU, a Pentium 4 killer by any other name. In fact, it's such a processing powerhouse, Intel apparently felt compelled to issue a response in the form of the "Pentium 4 Extreme Edition." The P4EE announcement came just as we were sending the final pages of this issue to our printer in Woodstock, Illinois. The vast majority of the mag had already been put to bed, so our only recourse was to briefly report on Intel's new chip in our Quick Start section (see page 12).

Now, do we have an actual P4EE chip humming away in the Lab? Yes. It arrived a few days after Intel's surprise announcement. As I write this, Gordon is collecting P4EE benchmark scores—but you won't be reading about them in this particular issue of *Maximum PC*. This column is the only page that hasn't yet been put to bed, and it isn't long enough to support a fair and thorough benchmark analysis.

No, I won't give you benchmark scores, but I will tell you that Gordon's tests show that the P4EE gains back much of the performance advantage that the "vanilla" P4 lost to the Athlon 64 FX. In other words, it appears that the very power shift explained on pages 64 and 65 has just shifted back.

Damn AMD! Damn Intel! Damn technological progress! And damn our damn deadlines!

Does this mean that the P4EE should be your next CPU buy? What of its cost and availability? And might not AMD simply issue a response to the response and jump back on top? Can't answer those questions here. But I can advise you to check back next month for a rousing Apple G5 versus Athlon 64 FX versus Pentium 4 EE showdown. We'll answer all your questions there.

Next month, we'll also dig deeper into the nVidia/*Half-Life 2* dust-up explained on page 11 (another event that occurred after we finished half the magazine), and pass judgment on whether system vendors should be shipping nVidia cards in their most high-end PCs.

—JON PHILLIPS

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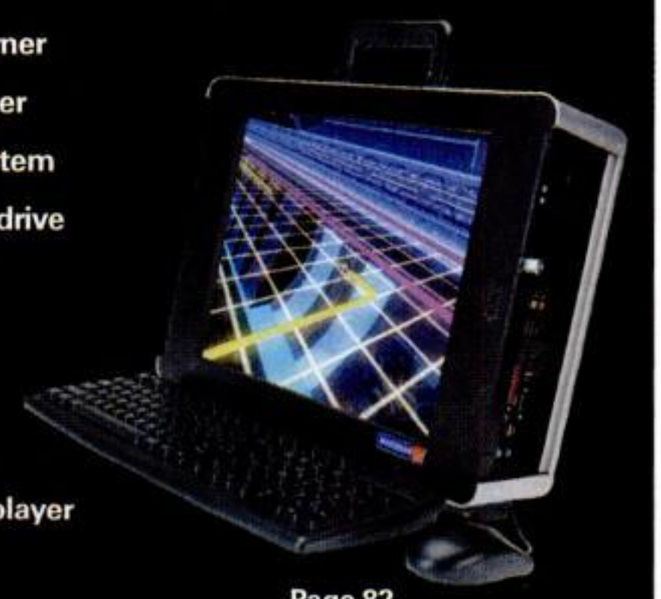

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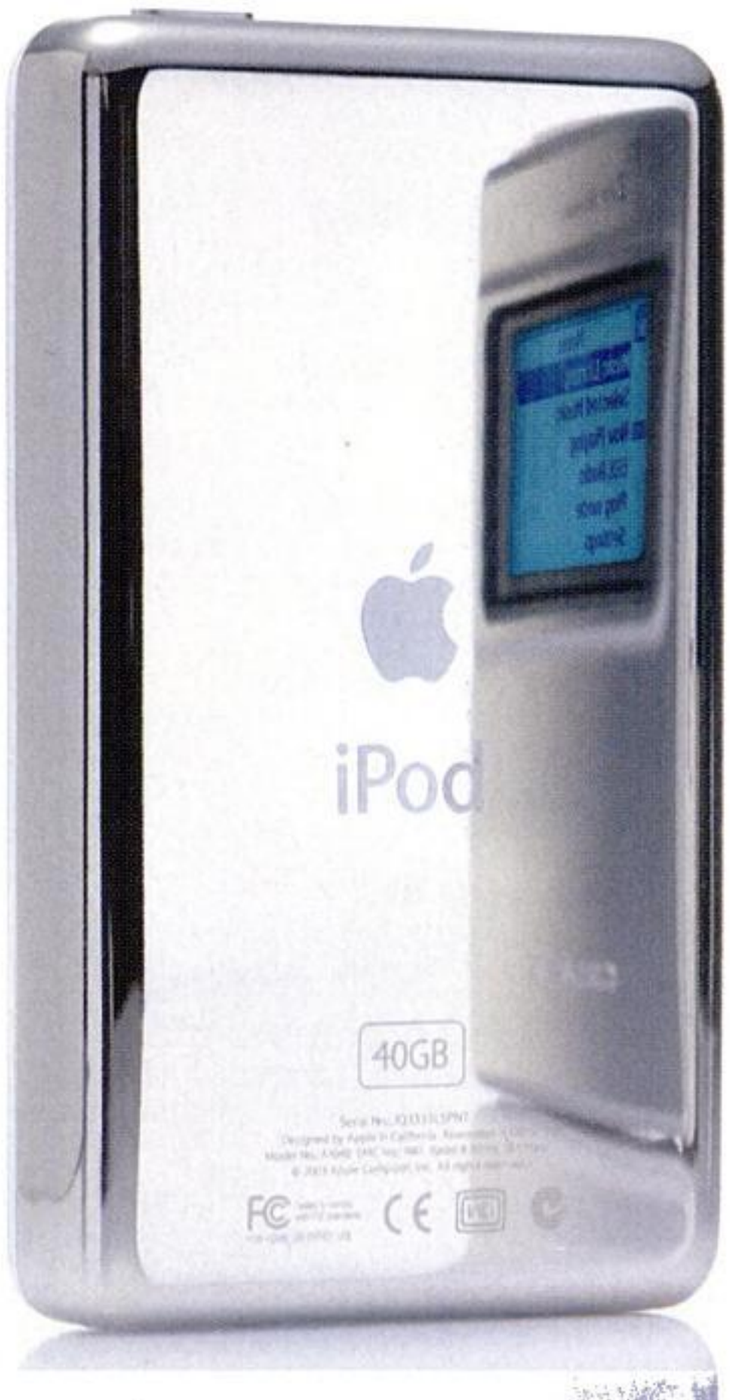
Not just another pretty face



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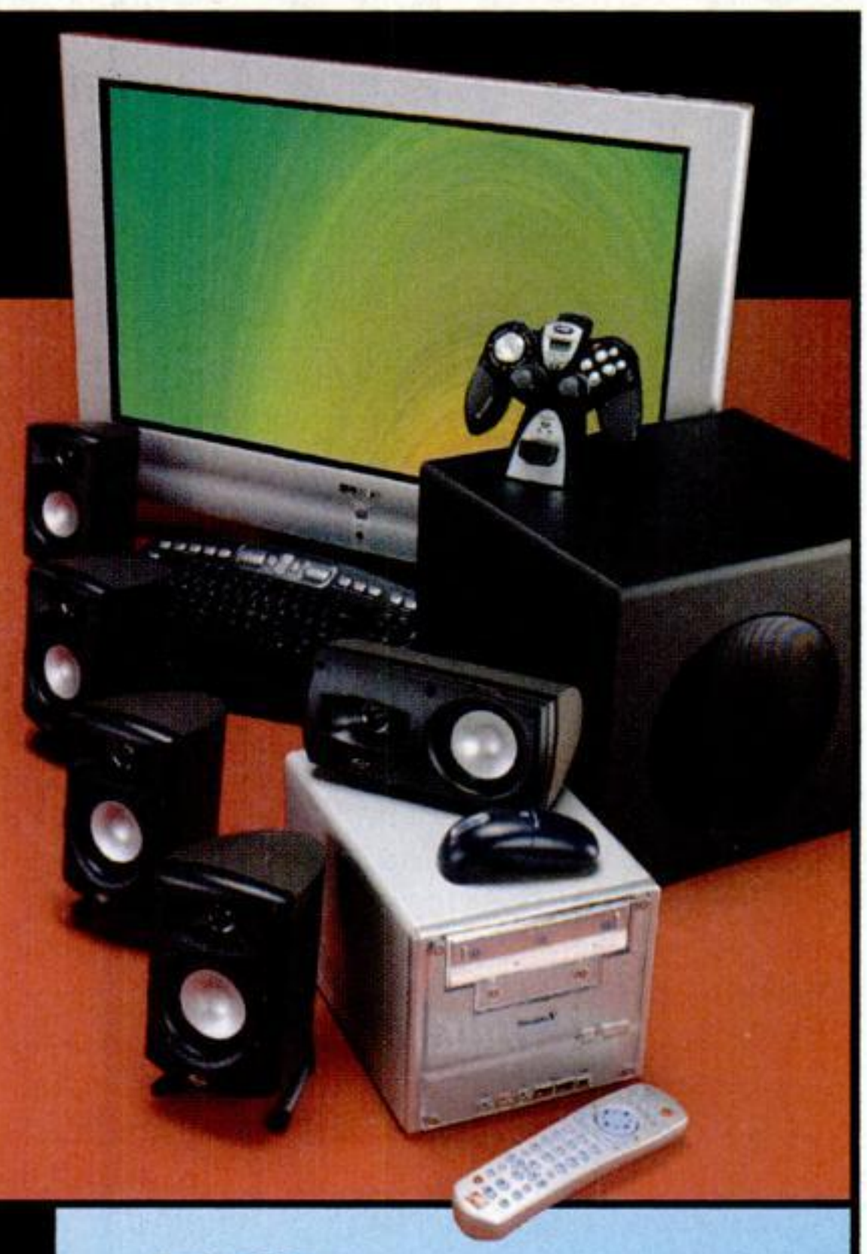

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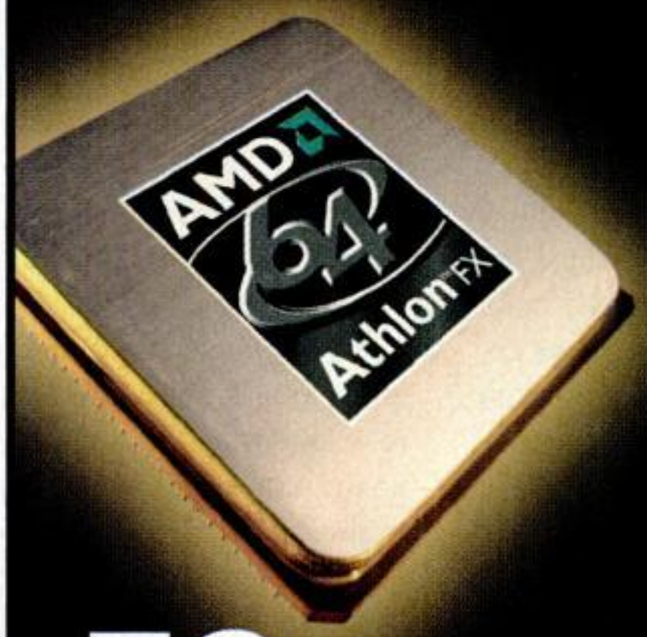

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In/Out

You write, we respond

SPAM SPAT

I read your October "PC Toolkit" article with great interest, especially the commentary about McAfee *Spamkiller.* I strongly disagree with the article's comment, "*Spamkiller* should be avoided at all costs. Its interface is unwieldy and its filters are inaccurate." I must say that after close to 10 months of using *Spamkiller*, I believe it does an excellent job filtering spam. While your article indicated a 95 percent success rate with *SpamPal*, I experience a 99 percent success rate with McAfee's *Spamkiller*.

—WAYNE GREEN

TECH EDITOR WILL SMITH REPLIES: I spent the better part of a week struggling with *Spamkiller*, and I stand by my comments. To test the different anti-spam utilities, I used my own e-mail accounts, which daily receive between 100 and 500 spam messages, but usually only 50 or so real e-mails. *Spamkiller's* interface is too unwieldy to manage that volume of e-mail, even during the setup phase.

On the other hand, *SpamPal*, *Inboxer*, and *Mail Enable* all handle large volumes of e-mail without a problem. *Inboxer* lets you categorize messages as spam, and handles the creation of new filters from within *Outlook*. If a piece of spam slips through your filter, you press the block button and it (along with all messages like it) will be blocked in the future. *SpamPal*, meanwhile, requires virtually no tweaking once it's installed.

It's great that *Spamkiller* has been able to serve your needs, but there are many superior anti-spam products available today. Spam blockers shouldn't require constant tweaking to work.

SOFTWARE ON THE SIDE

In the October review of Micro 2000's Universal Diagnostic Toolkit, you stated that "Micro 2000's software is the most valuable part of the bundle," but failed to mention that the software (called *Micro-Scope*) is also available separately at a much lower cost, and that free lifetime tech support comes with both the POST card and *Micro-Scope*.

—DOUG OWEN, TECHNICAL EDITOR, MICRO2000 INC.

TACKLE NOT INCLUDED

I enjoyed seeing what was stuffed into your Portable PC Trauma Kit [October]. But you failed to mention one thing I was interested in—the model and manufacturer of the toolbox itself. Can you provide that info?

—CHUCK MILLER

SENIOR EDITOR GORDON MAH UNG RESPONDS: It's a good ol' Plano 8606 six-tray fishing tackle box. We've seen it listed on Internet sites for between $19 and $70. Although not quite as large as the Plano 747M (which is preferred by most paramedics), it has a few more compartments for knick-knacks.

BUT I DISTINCTLY HEAR A CLICKING NOISE

I enjoyed your article about hard drives ["Hard Drive Handbook," October]. But did I miss the explanation of why they click? You stated that the arm is controlled by an electromagnetic current between the copper coil and the magnet. That sounds like a frictionless bearing. So where does the clicking come from if there's no friction?

—ERIC WANNEMACHER

FEATURES EDITOR LOGAN DECKER REPLIES: Fat-free potato chips have a little fat in them. Decaf coffee actually contains some caffeine. And so-called frictionless bearings still have to contend with a certain amount of friction.

The gentle clicking noises you hear come from the arm assembly sweeping across the platter, halting at precise points, and swinging back into action—thousands of times a second. This extremely quick action, combined with air resistance and the natural resonance of the drive chamber all contribute to the sound from your drive.

If you notice any change in the character of the noise from your drive, if the clicking sound becomes regular and rhythmic, or if you hear unusual grinding noises, these are all clues that your hard drive is on the brink of failure. Back it up, and buy a new one.

GETTING LOOSEY-GOOSEY WITH RAID CLAIMS

I write this regarding Dwight Looi's "Raid Levels Compared" table found in the "Hard Drive Handbook" article. In the Raid Level 0 row under the "Advantages" heading, it says, "Very high read and write performance—almost that of a single drive multiplied by the number of drives used." Wow. I saw approximately the same offhand remark in an article from a competing magazine about six months back, but I never expected this level of inaccuracy from *Maximum PC*. So what gives with this flippant generalization? In past testing, you have pegged the RAID 0 advantage at 20 percent or less.

—RAYMOND MANN

SENIOR EDITOR GORDON MAH UNG REPLIES: D'oh! Indeed, 2x performance from RAID 0 is pretty impossible. In that chart, we should have stated that read and write performance can increase anywhere from 5 to maybe 30 percent, depending on the RAID setup and application.

POINT GOES TO FORMAN (IN THE SILLY GAME OF ONE-UPSMANSHIP)

Most slip-ups I can let go. I didn't even write last month when Tom McDonald's column ended abruptly in the middle of a sentence. However, due to the specific topic John Phillips was discussing in the October Release Notes, I cannot stay silent. John writes: "First and foremost, were magazine editors—wordsmiths, investigative reporters, and

BUT DO THEY MEET THE ATX KABOB SPEC? THAT'S WHAT WE'D LIKE TO KNOW

I've been a subscriber for two years now and I love your mag. It's a high point of my month when *Maximum PC* arrives from New York in the UN diplomatic pouch. Anyway, a friend, briefly stationed in Iran last year, came across this case being used as a BBQ for kabobs. I thought you guys might get a kick out of it.

—BOB CANNON, D/CISS, UNAMSIL, FREETOWN, SIERRA LEONE

EDITOR-IN-CHIEF JON PHILLIPS REPLIES: See what happens when you overclock without proper cooling! Cheers go out to Bob for what must be an incredibly tough and dangerous diplomatic mission in Sierra Leone, and props to all our passionate readers in Iran. (Yes, some Iranians do receive our magazine. PC fanaticism knows no ideological boundaries.)

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logical thinkers."

"Were" magazine editors, John? As in "used to be"? I'm afraid the word "were" means something totally different than the conjunction "we're" (we are). And no, spellchecker wouldn't have caught that, as "were" is, in fact, a word. It's just not the correct one to use in this context.

Perhaps aisle right an article four ewe to revue. I've always been told I have a way with words.

—HAROLD FORMAN

EDITOR-IN-CHIEF JON PHILLIPS REPLIES: Even a single proofreading mistake is one proofreading mistake too many. But in the editorial ranks—that is, in professional publishing circles where we're actually paid to toil day in, day out—we draw a distinction between poorly organized, uninteresting writing, and writing that suffers flaws of basic human error.

Poorly organized, uninteresting writing is *much* more egregious than writing that suffers a few proofreading errors. I think all experienced editors would agree. Proofreading errors shouldn't be given a "free pass," but they're inevitable, especially in magazines like *Maximum PC*, which are pushed to the absolute limit in respect to deadlines and staff resources. In short, I'll take a homonym error over a grammar error (or, even worse, a benchmarking error) any day.

I should also point out that you spelled my name with an "H" throughout your entire letter. An innocent homonym mistake? I would assume so. But it certainly **doesn't bother me. Most good writers—writers who dash out copy off the top of their heads, writers whose brains are one step ahead of their fingers—are wont to make homonym mistakes every now and then.**

YEP, SOMETHING IS DEFINITELY BURNING

In his October letter, Scott Marshall made an excellent point that burning CAT-5 cable (or any cable with a PVC jacket) releases fumes that can be deadly if inhaled. I too am working on my CCNA, and would like to point out that if running cable through air ducts is your only option, you can use CAT-5 Plenum cable. It is much more expensive, but it's safe to use in air ducts.

—DAVID FERRIS

OUTLINING THE NEW MP3 REGIME

In response to Edward Reasor's letter in the October issue: I understand that MP3s are being stolen every day and taking money from the industry. But these are the same companies that have been stealing from us, charging $15 for a single CD when we only want one or two songs.

Let's be real. We can all agree that MP3s are here to stay, and we should find a way to make them work. We can't put the genie back in the bottle. The recording industry should embrace the new technology, and quit spending millions trying to stop it.

The record companies could start selling MP3s/WMAs on a subscription or per song basis via legal software (and I don't mean like the new *Napster*—it sucks). Sell each song for 50 cents or so. The recording industry would save the millions of dollars being spent on chasing people down, and make back any money lost to piracy. Music no longer has to be pressed, mass-produced, or marketed.

Doesn't this all sound better?

—CAMERON WILLIAMS

GETTING GRABBY

I was wondering what screen-capture software you folks use for the images in the magazine. I am assuming, of course, that not all of the software and Windows screens displayed in the magazine are provided by their manufacturers.

—DANYEL MARRS

TECH EDITOR WILL SMITH REPLIES: We pride ourselves on not using any vendor-supplied art! For most games, we use either the in-game screenshot utility (if available), or a third-party grabbing app. *Hypersnap* and *Snag-it* are our favorites. For Windows apps, we use Windows' built-in ability to copy what's on screen to the clipboard. You can either press PrtScn and then paste the output into a *Paint* window, or press Alt+PrtScn to copy just the window that's currently active.

For BIOS and other non-Windows shots, we usually set up an LCD display in a dark room, and photograph the screen. We've experimented with an alternative method, using our videocard's S-video output to send a signal to a video-capture device, but this resulted in images that were too fuzzy to use. ■

> ***"THE RECORDING INDUSTRY SHOULD EMBRACE THE NEW TECHNOLOGY, AND QUIT SPENDING MILLIONS TRYING TO STOP IT."***

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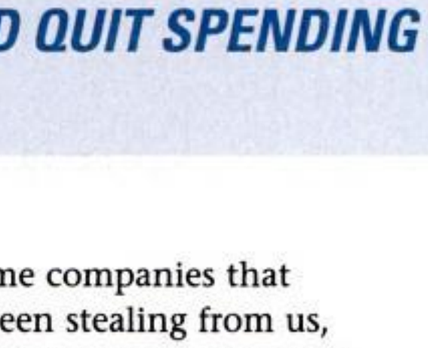

COMING NEXT MONTH

IN THE SWEETER THAN FIGGY PUDDING DECEMBER ISSUE OF MAXIMUM PC

Gear of the Year

First we nominate. Then we argue. Then we vote. And then we reveal. Behold, the absolute best hardware components released in the last 12 months! Motherboards, videocards, optical drives, and more—Lab-tested and *Maximum PC* approved. Our list cannot be disputed!

Digital Toys for Girls & Boys

Remote-controlled helicopters, Star Wars action figures, potato guns? No, none of these will be included in this year's Holiday Gift Guide, but we will present a bounty of geeky gadgets and peripherals that should appeal to hard-core computer enthusiasts and like-minded aesthetes.

G5 vs. the World

You asked for it, readers—a benchmarking showdown between Apple's fastest G5, and the best desktop procs that Intel and AMD have to offer. Will we shut the Macintosh pie hole once and for all, or end up with apple sauce on our faces? Find out next month.

PLUS: New *Maximum PC* benchmarks, the winner of our Coolest PC Case Modding Contest, and a close-up look at *Half-Life 2* (assuming the damn game is ready in time!).

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Quick Start

The beginning of the magazine, where articles are small

RIAA Death Star Almost Complete

Record industry watchdog deploys first wave of lawsuits against MP3 file sharers

The Recording Industry Association of America's long-running jihad against peer-to-peer file swapping recently entered an ugly new phase when the trade group filed lawsuits against 261 individual file swappers, including a 12-year-old girl. The RIAA is no stranger to litigation, but the recent spate of suits marks the first time the industry bulldog has gone after file-sharing individuals instead of the companies producing file-sharing software.

To find file-sharers trafficking contraband, the RIAA uses a software program to scour P2P networks searching for copyrighted material. When such files are located, the RIAA records your username and IP address, and downloads the files to verify their authenticity. Once the RIAA has nailed down its case against you, it subpoenas your ISP to acquire your identity. Once it acquires this information, the RIAA will contact you about your activities. Some ISPs have fought these subpoenas in court, but most have been unsuccessful.

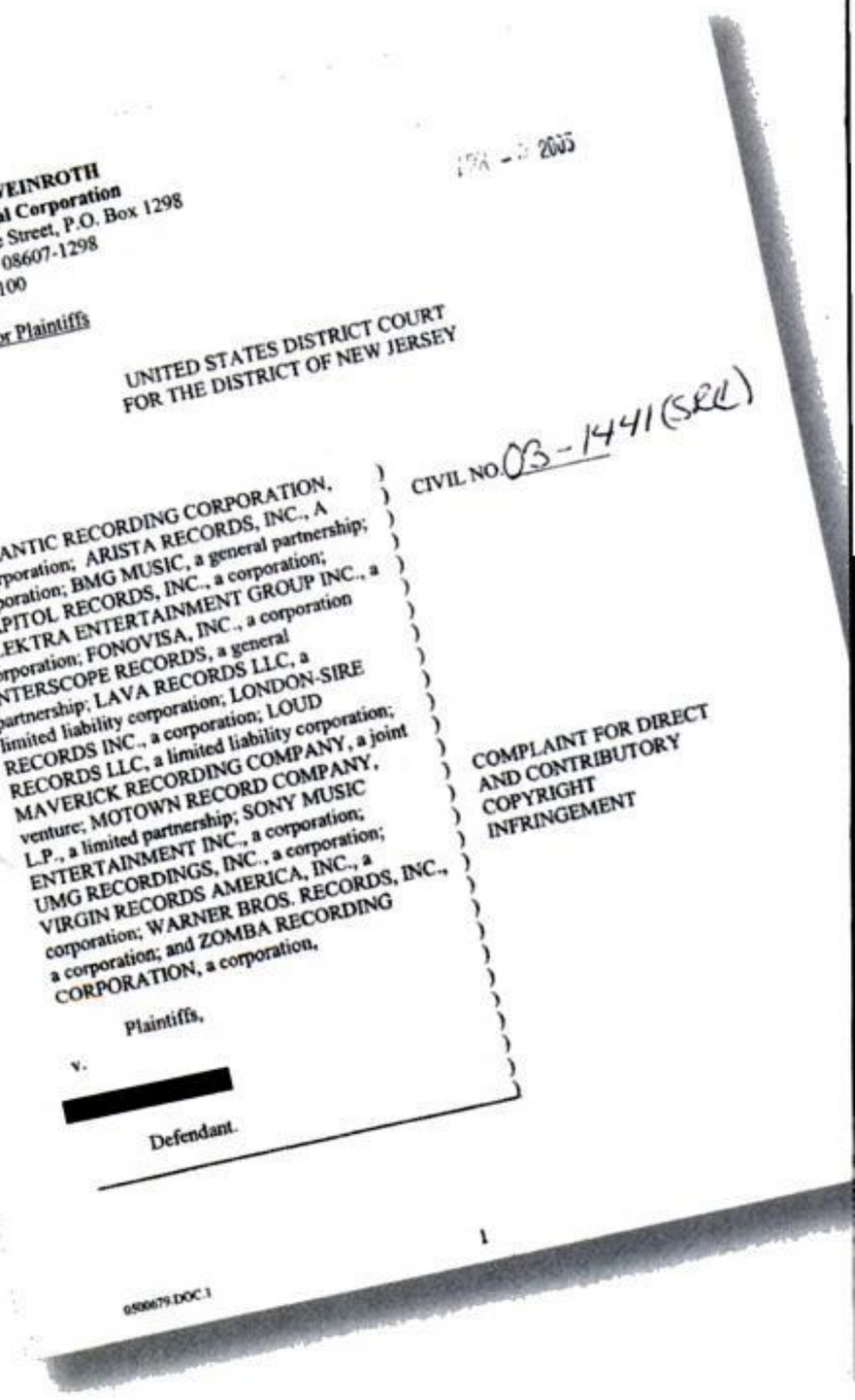
So far, the RIAA says it is only targeting "egregious" file sharers, which it describes as people sharing 1,000 or more files. However, if a 12-year-old girl can unwittingly draw the RIAA's ire, so could you. With that in mind, there are a few steps you can take to avoid the RIAA's wrath.

First and foremost, don't share copyrighted material over P2P networks. You might also want to disable the option to share content with other users. It's a greedy move, obviously, but it's better to be greedy than to be a defendant.

> "...Defendant has taken a network created for higher learning and academic pursuits and converted it into an emporium of music piracy where copyright infringement is simplified down to the click of a computer mouse."

Second: Don't let your computer function as a "supernode," which is a node that acts as a conduit for other peoples' file requests. If you have a fast computer and a blazing connection to the net (as you should, dear reader), it's possible your computer will automatically become a supernode. To disable this option in *Kazaa*, go to Options > Kazaa Options, select the Advanced tab, and check the box marked "Do not function as a SuperNode."

If you want to come clean, the RIAA is offering an amnesty program called "Clean Slate" whereby you sign a mea culpa in return for protection from a lawsuit. However, some attorneys are advising against this practice, since it entails admitting guilt and doesn't offer you any legal protection from RIAA members (the actual record labels).



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Attorney for Plaintiffs

UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF NEW JERSEY

ATLANTIC RECORDING CORPORATION, a corporation; ARISTA RECORDS, INC., A corporation; BMG MUSIC, a general partnership; CAPITOL RECORDS, INC., a corporation; ELEKTRA ENTERTAINMENT GROUP INC., a corporation; FONOVISA, INC., a corporation INTERSCOPE RECORDS, a general partnership; LAVA RECORDS LLC, a limited liability corporation; LONDON-SIRE RECORDS INC., a corporation; LOUD RECORDS LLC, a limited liability corporation; MAVERICK RECORDING COMPANY, a joint venture; MOTOWN RECORD COMPANY, L.P., a limited partnership; SONY MUSIC ENTERTAINMENT INC., a corporation; UMG RECORDINGS, INC., a corporation; VIRGIN RECORDS AMERICA, INC., a corporation; WARNER BROS. RECORDS, INC., a corporation; and ZOMBA RECORDING CORPORATION, a corporation,

Plaintiffs,

v.

[redacted]

Defendant.

CIVIL NO. 03-1441 (SRC)

COMPLAINT FOR DIRECT AND CONTRIBUTORY COPYRIGHT INFRINGEMENT

1

0500679.DOC 1

If you'd prefer not to receive one of these in the mail, you may want to rethink your approach to file sharing. And just look at all the big-name plaintiffs!

Five Years of Facing the Music: A look at the RIAA's reign of litigation terror

October 1998	December 1999	February 2000	October 2001	January 2002	May 2002	April 2003	June 2003	September 2003
Diamond Multimedia is sued by the RIAA over its newfangled Rio MP3 player. WINNER: Diamond	Napster ends up in San Francisco federal court thanks to a suit by the RIAA alleging copyright infringement. WINNER: RIAA	MP3.com is sued after it rips 45,000 CDs into a database to allow subscribers to listen to them over the Internet. WINNER: RIAA	P2P networks Grokster and Morpheus are dragged into court for promoting piracy. Kazaa is later added to the lawsuit. WINNER: P2P networks	RIAA sues AIMster for copyright violations. WINNER: RIAA	Music swapping web site Audiogalaxy receives the sue-hammer for being a "Napster clone." WINNER: RIAA	RIAA sues four university students in federal court, accusing them of running Napster-like networks on their college LAN. WINNER: RIAA	Citing a provision of the Digital Millennium Copyright Act, the RIAA demands that Verizon hand over the identities of four alleged copyright infringers. Verizon refuses. The issue goes to court. Verizon loses. Winner: RIAA	RIAA files suits against 261 file traders, including a 12-year old girl from New York.

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nVidia Shaders Take a Hit

nVidia GPUs not ideal for *Half-Life 2*, Valve cautions

In September, a controversy swept the Internet. The topic: The performance and visual quality of nVidia's GeForce FX 3D accelerator in upcoming DirectX 9 games, specifically *Half-Life 2*.

Here's how it breaks down: On Sept. 10, ATI sponsored an event in Seattle for journalists to hear various industry potentates discuss the current state of programmable shaders and DirectX 9. Speakers included ATI engineers, third-party software developers, people from Microsoft's Direct3D team, and developers from Valve Software, which is designing *Half-Life 2*. Valve's managing director, Gabe Newell, talked about the different ways nVidia and ATI have cheated in recent benchmarks. He also talked about the performance of ATI and nVidia GPUs in the upcoming game.

Newell's report was surprising. Valve's testing showed that the GeForce FX 5900 Ultra runs *Half-Life 2* in DirectX 9 mode at about 30fps. This is slower than a Radeon 9600 Pro, ATI's second-best videocard. nVidia's other DirectX 9 cards, the 5200 and 5600, wouldn't even run *Half-Life 2* at a playable speed.

It appears there are two problems with GeForce FX cards and *Half-Life 2's* shaders. Valve has determined that 24-bit floating point is the optimal color depth for DirectX 9 games. 24-bit color is virtually indistinguishable from the more demanding 32-bit mode, and provides much more color precision and range than the 16-bit mode. Unfortunately, nVidia cards support only 16-bit and 32-bit floating-point color, not 24-bit.

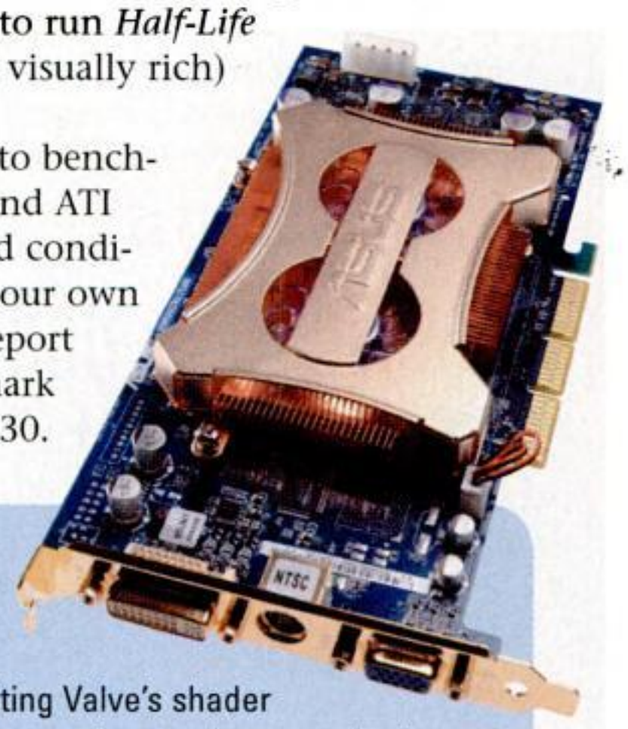
The main problem, however, lies in optimizing DirectX 9's High Level Shader Language (HLSL) for different chipsets. GPUs have very deep pipelines, much like the Pentium 4. If shader code isn't optimized to keep a pipeline busy throughout each clock cycle, performance will suffer. Right now, the *Half-Life 2* shader code is not optimized for nVidia hardware. Whose fault is this? The Valve camp implied that the poor performance is due to unwieldy nVidia hardware that doesn't meet the DirectX 9 spec, but nVidia is insistent that Valve's shader code isn't properly optimized. Meanwhile, ATI is smugly enjoying a massive PR victory.

***Half-Life 2*: Looks like a GPU buster, doesn't it?**

Given that Valve's presentation was delivered at an ATI event, and that ATI and Valve have a bundling deal, some might suspect the two companies of playing politics. John Carmack of id Software, however, expressed a similar caveat about nVidia (see sidebar), and it's unlikely that two of the most powerful game developers would go out of their way to diss the videocard behemoth.

Regardless, Valve doesn't want to leave nVidia owners in a lurch, so the studio rewrote *Half-Life 2's* shader programs to use 16-bit precision where possible. The developers also rearranged the order in which engine code is run on nVidia GPUs to improve performance. However, even this wasn't enough for nVidia's 5200 and 5600 cards. So, for all shader-capable cards save the 5900, Valve's solution is to run *Half-Life 2* in the less demanding (and less visually rich) DirectX 8 mode.

Valve allowed event attendees to benchmark *Half-Life 2* on both nVidia and ATI cards, but under strictly controlled conditions. When we get *Half-Life 2* in our own Lab, we'll run the numbers and report back. Valve promised the benchmark would be available on September 30.



The Carmack Speaketh

Is *Half-Life 2* a reliable DirectX 9 benchmark? Both Microsoft and id's John Carmark say yes. Here's Carmack's statement from bonusweb.cz, in which he opines on the latest nVidia imbroglio: "Unfortunately, [*Half-Life 2*] will probably be representative of most DX9 games... [Lowering precision] doesn't really matter to *Doom*, but that won't be a reasonable option in future games designed around DX9-level hardware as a minimum spec."

The Response from nVidia

In an official statement, nVidia said that the 45.23 Detonator drivers used to test the 5900 Ultra during the event weren't indicative of current nVidia performance in DirectX 9 games. nVidia recommends using new 51.75 drivers for the best *Half-Life 2* performance. nVidia's chief scientist, David Kirk, said, "We make a firm commitment that nVidia hardware will provide as good or better image quality than competitor products at comparable frame rates."

Kirk said the main enhancement to nVidia's 50 series of drivers is a run-time compiler that will recompile DirectX 9 HLSL shader code into a more nVidia-friendly format, all without sacrificing image quality. By recompiling the shader programs when the game runs, the programs will run more efficiently on nVidia GPUs, keeping the entire GPU pipeline busy all the time. This recompiling, however, raises a host of other issues.

If nVidia's drivers are essentially rewriting Valve's shader programs, how can reviewers do an apples-to-apples benchmark comparison between nVidia and ATI hardware? And how will recompiling shader programs affect image quality? We tested the 51.75 drivers with *Tomb Raider: Angel of Darkness* (one of the few games currently available that use Pixel Shader 2.0), and saw a marked image quality decrease between the beta 51.75 and the 45.23 drivers (remember, the 40 series drivers don't include the new compiler). nVidia says the visual quality difference is due to a bug that will be repaired.

We'll dive deep into the DirectX 9 shader story next month. In the interim, we suggest that anyone planning to buy an nVidia-powered videocard for *Half-Life 2* should wait until more data is in.

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Intel's Latest: All Flash, Massive Cache

Here's the inside scoop on the would-be Athlon 64 FX killer

Intel is out to steal the thunder from AMD's Athlon 64 FX-51 launch with a new chip of its own. Dubbed "Pentium 4 Extreme Edition," the chip matches the current 3.2GHz P4 in most features, but also adds a silly-large 2MB Level 3 cache, giving the CPU a total of 2.5MB of full-speed, on-die cache.

Intel will market the chip to PC enthusiasts who want ultimate performance, and charge a premium for it to boot (pricing specifics haven't yet been announced). Does this strategy sound familiar? AMD is itself going the "low availability, high price" route with the Athlon 64 FX.

Intel's P4E announcement surprised everyone. Intel usually briefs us on new chips way before they're launched, and even if a processor company did want to keep a pending announcement secret, inevitable leaks would blow the cover.

Intel's Pentium 4 Extreme Edition is targeted at anyone who wants to pony up extra cash for extra cache.

In fact, Intel's next big news was expected to be a 90 nanometer version of the P4, but at its fall developer forum, the company pulled out the P4E instead. The 90 nanometer chip code-named Prescott is still on schedule, company officials say, and should be out by the end of this year.

The P4E's die isn't exactly new. It's a direct derivative of the XeonMP server chip, which Intel sells for—get this—$3,700. Because of its large cache, the chip runs slightly hotter and sucks up more power than the normal P4. Expect a showdown between the P4E and Athlon 64 FX in our next issue.

ExpressCard—Don't Leave Home Without It

Add-in cards for laptops get a humongous speed boost

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ExpressCard will debut in two sizes. ExpressCard34 is 34mm wide, while ExpressCard54 is 54mm wide. Like the old Type I/Type II skidoo of CardBus designs, a 34mm will be usable in a 54mm slot, but not vice-versa.

ExpressCard increases the throughput from today's 800Mbps to roughly 2Gbps. Such are the advantages of moving from the parallel interface used in today's CardBus designs to a serial interface using PCI Express.

Internally, ExpressCard will plug directly into a motherboard chipset's southbridge and use both the PCI Express bus and the USB 2.0 bus for high data-rate and low data-rate devices, respectively. With the additional bandwidth, ExpressCard devices will be able to support higher-speed mini hard drives, and TV tuners, and better AV streaming than CardBus devices could ever hope to. Another advantage ExpressCard will have is the lack of a separate controller chip. Today's CardBus devices require a controller chip that adds heat, increases cost, and sucks power.

Expect to see ExpressCard slots in laptops (and possibly even desktop PCs) by the middle of next year.

The 64-Bit Question

Who really needs a 64-bit processor? AMD says everyone does. Apple says high-end Mac users do. Corporations that run databases and other large server applications say they do, too. The overclockers and supercoolers who wring every last drop of performance from their heavily modded PCs insist they need a 64-bit processor more than anybody. And the PC gamers who don't realize their 32-bit CPUs already have 80-bit floating-point units and 128-bit multimedia extensions think they need a 64-bit processor because... well, just because.

Forget about 'em. Truth is, there's somebody else whose need for a 64-bit processor outshines them all: Intel.

Poor Intel. The world's largest chip company is bringing up the rear in the 64-bit derby. AMD, which is outsold by Intel three to one, is making so much noise about its Athlon 64 that you'd think the chip was a combination antigravity machine, cold-fusion generator, and matter transporter. Apple is running ads in which users of the new 64-bit PowerPC G5 Macs are literally blown out of their chairs by explosive processing power—or maybe the controversy over dodgy SPECmarks. Every other high-end microprocessor architecture has been chewing 64 bits for years.

Only the x86 lingers in 32-bit land, and now AMD is finally dragging the architecture out of the 1980s. Meanwhile, Intel—which invented the x86—is struggling to disengage its crotch from a fence. Shaking one leg, Intel argues that it already has the next-generation 64-bit architecture: IA-64, the basis for Itanium. IA-64 is backward-compatible with 32-bit x86 and offers numerous technical improvements. But IA-64 is already nearing 10 years old and shows no sign of imminently entering the PC market. It's still too big and expensive.

Intel's other leg wants to hop off the fence and chase AMD by introducing a competing set of 64-bit x86 extensions. But the heavy Itanium leg is holding Intel back, and an amputation would be too painful to bear.

Nevertheless, I think Intel will chase AMD. The torture of watching AMD carry Intel's prize jewel into the 64-bit age will eventually force Intel into action. I also think Intel's 64-bit extensions won't be 100 percent compatible with AMD's. Microsoft claims it won't support more than one set of 64-bit extensions in Windows and has already bet on AMD64, but I expect Microsoft to flip-flop when Intel does. That might leave users uncomfortably straddling a fence, at least for a while. However, the other possible outcomes seem less likely: a permanent 32/64-bit rift between Intel and AMD, or a total collapse of AMD that makes the whole thing moot.

Tom Halfhill was formerly a senior editor for Byte *magazine and an analyst for* Microprocessor Report. *He is now a technical writer/analyst in Silicon Valley.*

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When Handhelds Collide

PDAs meet gaming consoles meet phones

How do you lure twitchy mobile gamers away from Nintendo's ubiquitous GameBoy? Well, we've seen a number of approaches, and most of them involve upping the ante on mobile gaming by adding utilitarian functions such as a phone, PDA functions, wireless capabilities, multimedia playback, and a coffee grinder.

OK, well maybe not the coffee grinder, but everything else is true. Each new platform has a different emphasis, so here's your tip sheet on the big three mobile platforms about to round the corner.

NOKIA'S N-GAGE

➤ **FEATURES:** Integrated phone, MP3 player, and PDA based on the Symbian OS. Support for POP3 and IMAP e-mail, web browsing, MMC cards, Bluetooth, and GPRS wireless service.

➤**PROS:** The N-Gage is the most comprehensive and feature-packed platform. Nokia has already stacked up big licenses like *Splinter Cell* and *Tony Hawk*. Several applications can run simultaneously, allowing you to blab on the phone and play a game at the same time.

➤**CONS:** Using the N-Gage as a phone has been described as "holding a taco to your ear." In a word: awkward. The screen is also small compared with Tapwave's Zodiac. **$300, www.n-gage.com**

TAPWAVE'S ZODIAC

➤ **FEATURES:** 3.8-inch LCD screen running at 480x320—that's a higher resolution than you get on a Pocket PC! Includes an analog D-pad, Bluetooth support, and the Palm OS with all the fixins under the hood.

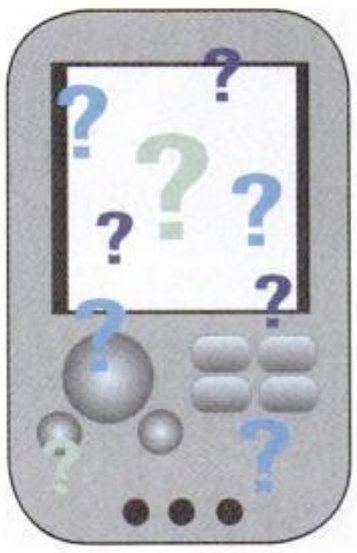
➤ **PROS:** This is the handheld for the serious gamer who can't wait for Sony's PSP. Impressive resolution and analog control will blow the N-Gage out of the water—as long as the games are there.

➤**CONS:** Mobile web browsing requires separate mobile phone with data service. Name reminiscent of Bay Area serial killer.

$400, www.n-gage.com

SONY'S PSP

➤**FEATURES:** Incredible 16:9 widescreen LCD running at 480x272 in 24-bit color. Proprietary UMD media can hold 1.8GB of data or two hours of (highly compressed) video. Ten times the clock speed of the original PlayStation.



➤**PROS:** Although the PSP isn't likely to bundle a phone or PDA, it is easily the most massively spec'd of all three platforms. Ports of the gi-normous existing PlayStation software library are likely.

➤**CONS:** Won't be out until late next year, and at press time, all the specs still stand for "speculative." **Price not yet determined, www.sony.com**

GAME THEORY BY THOMAS L. McDONALD

Jedi Academy Frees the Inner Geek

As my kids have grown, I've gradually embraced my inner geek. It started simply enough, and always with the reason (excuse) that I was doing these things for my son: buying incredibly complex and expensive Lego sets, reading comics, collecting superheroes, buying Star Wars figures, and, well, generally doing that whole Star Wars thing.

But, frankly, it's all become a pretense. I've spent 17-odd years as an adult, tending to adult things as much as a man who plays and writes about games for a living can claim to be tending to adult things. Grown men who retained a fascination for Batman and Darth Vader were an object of pity for me. Then I became one. It's all rather disturbing.

So it was that my heart sank with the drudgery and tedium of *Star Wars Galaxies* (which I reviewed in the October issue), when I had been hoping it would satisfy that SW jones. Fortunately, in short order, *Jedi Knight: Jedi Academy* came along just a month later, and did the job quite nicely.

The *Dark Forces/Jedi Knight* games have always been among my favorite FPS titles. They would have been exceptional action games divorced from the license, but with the license they became far more (particularly to someone who was 9 years old in 1977 and a charter subscriber to *Bantha Tracks*). *Jedi Academy* is made for the fans, that much is clear from the start. You can not only choose your appearance, but also your light-saber hilt style and blade color. Instead of dangling the promise of a light-saber in front of you for half the game (as in *Jedi Outcast*), *Jedi Academy* gives you the weapon and some force powers right away, which is immensely more satisfying.

With all the features and inside references, *Jedi Academy* is truly a game for SW fans, and I'm certainly one of them. I've finally come to terms with my geekdom. I'm halfway through the 12 volume *History of Middle Earth*, I read about 10 comics a month, and I've reconciled myself to the odd charge I get when my boy finds a new Star Wars figure. I spent my years studying American literature and foreign film at NYU: I've nothing left to prove. I finally realized that putting away childish things (in the words of St. Paul) means losing a good bit of the joy from life. My kids gave me that back, and it lets me enjoy my work more than ever before. I think that adds considerably to my enjoyment of *Jedi Academy*, but fan or not, it's a rip-snorting good game.

Tom McDonald has been covering games for countless magazines and newspapers for years. He lives in the New Jersey Pine Barrens.

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MOZILLA FIREBIRD 0.6

Stability: It's named *Firebird 0.6*. The version number hasn't even hit 1.0! This means *Firebird* is still beta, kids, and thus might behave like any beta software. I.e. (no pun intended), badly. We haven't experienced any *major* problems with it, aside from the occasional crash, but your mileage may vary. **Winner: Internet Explorer**

Features: *Firebird* is all about features. For example, tabbed browsing is the biggest innovation for web surfers since the HTML table made its first appearance. It works like this: Instead of opening different web pages in separate windows, you can open new pages in a single window, and then activate each page via tabs. Even better, you can save entire sets of tabs as bookmarks, or set them as your home page so all your favorite sites will pop up whenever you open the browser. **Winner: Firebird**

Speed: *Firebird* is much faster than the stock *Mozilla* install, but it's still not as fast as *IE*. Word on the Internet has it that *IE* beats other browsers by performing some proprietary tricks with Microsoft web servers, but who cares. The fact is, *Firebird* isn't painfully slow, and lags behind *IE* by just 1.2 seconds. **Winner: Internet Explorer**

Third-party support: Because the source code for *Firebird* is readily available to software developers, and because *Firebird* has both an easily skin-able interface and an extensible UI, it's easy for third-party developers to add cool new functionality. Case in point: The Optimoz mouse gesture extension, which lets you perform basic browser tasks by moving the mouse. Best of all, installing new extensions and skins is as easy as clicking a link on a web site. Finally, there's no Gator spyware plug-in for *Firebird*. **Winner: Firebird**

Compatibility: The *Firebird* team has spent loads of time tweaking the HTML renderer to draw web pages properly, whether they use standardized HTML code or the bastardized version that many nonstandard (read: Microsoft) web page editors create. The team has done an admirable job, but given the vastness of the web, you're bound to find an occasional page that works perfectly with *IE*, but chokes in *Firebird*. **Winner: Internet Explorer**

Convenience: An integrated pop-up blocker and tabbed browsing were enough to make us switch to *Firebird*. But an advanced cookie manager, a cornucopia of user-created skins, and 100-plus extensions—extensions that can do everything from tidying up bookmarks to running a Tetris clone—were enough to convince us we made the right choice. **Winner: Firebird**

MAXIMUM PC VERDICT 9

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Tabbed browsing, pop-up control, and no annoying ActiveX applets are all reasons to love *Firebird*.

– FREE BEER

Firebird still crashes occasionally, and it's not as fast or compatible as *IE*.

Free, www.mozilla.org

THE UPSHOT

It crashes occasionally, it's slower than the competition, and it doesn't display every page properly, but we still love *Firebird*. It seems like we've stated it 10 times already, but tabbed browsing kicks ass! The rest is just icing, but it's a delightful Mandarin orange-chocolate icing, not that Betty Crocker uniflavor crap from a can. *Firebird* is still a software adolescent, but every release is better than the last, and new features are actually useful instead of just cool. Best of all, *Firebird* is free, so there's no reason for you not to try it. ■

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~ Especially at 518° ~

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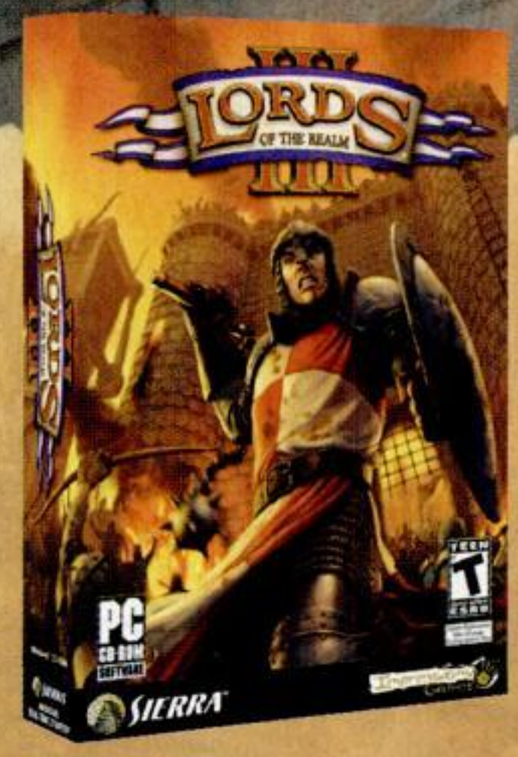

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WatchDog

Say hello to Dixie,
WatchDog of the Month.

Maximum PC takes a bite out of bad gear

THIS MONTH: The WatchDog goes after...
> Cendyne > Overclockershideout.com > IBM

This and That

Last month the Dog advised consumers to open their product packages before leaving the store, lest they be the victims of unscrupulous customers who swap out original parts for inferior parts before returning a product to the store. Well, two readers took issue with the advice. Mikhail A. Noel said he doesn't think it's always a consumer who does the swap out: "I suffered the same fate—three times. I ordered an ATI Radeon 9700 Pro from Amazon.com, and received a shrink-wrapped 9700 Pro box that contained an old ATI Rage 3D card. When I complained, I received yet another old ATI card. That happened twice. Eventually I gave up, asked for a refund, and ordered my part elsewhere. I doubt that a single unscrupulous customer was doing this."

Reader Kyle Howarth, on the other hand, said sometimes it's not so bad to get the wrong product: "I purchased a Western Digital 160GB 8MB cache hard drive at a Best Buy in Flint, Michigan, for $99 after rebates. It was a steal. When I got home I noticed "2000JB" stamped on the back of the drive. After further inspection, and a confirmation through installation, I discovered that it was indeed a genuine 200GB 8MB cache hard drive in 160GB packaging! What luck! I then went back to the store and looked for any more mislabels, because 50 cents per GB is hard to beat. The store had six drives left and four were 200GB models in 160GB packaging."

World-renowned PC geek Asia Carrera shows off a cooler sold by CPUFX. At least *she* looks happy.

> "WHAT LUCK! I THEN WENT BACK TO THE STORE AND LOOKED FOR ANY MORE MISLABELS, BECAUSE 50 CENTS PER GB IS HARD TO BEAT."

Hiding Out

DEAR DOG: I ordered a 6.4-inch LCD screen from Overclockershideout.com for $399 in late June. It's now late August and I still haven't received it. Now when I go to the web site, it's offline. What am I to do? I wanted to submit my case to the "Coolest Case" modding contest that *Maximum PC* has going on, but now I don't have the last little thing to make my case stand out. I can't get on the site, I can't contact anyone, and I want my $399 back!

— ZACK BIRLEW

THE DOG RESPONDS: There may be a reason the company is called Overclockershideout.com—it may be hiding out. Indeed, the Dog found that the phone lines and web site were down for Overclockershideout.com (aka CPUFX.com). Although the Better Business Bureau has relatively few complaints about CPUFX.com, consumers recorded negative comments about the company at Resellerratings.com—comments that echoed Zack's complaints: an inability to ship products and lack of support. What happened? Scot W. Mack, president of CPUFX and Overclockershideout.com, would not return calls to his home seeking comment.

The Dog recommends to Zack that he dispute the sale with his credit card company. And because the status of CPUFX and Overclockershideout.com is unknown, the Dog is exiling the company to the dog house. Woof.

Retail versions of the Pioneer DVR-A06U carry a full warranty while most OEM units do not.

Retail vs. OEM

DEAR DOG: I recently purchased a Pioneer DVR-A06U from AccuPC in El Monte, Calif., based on a *Maximum PC* review. After installing the drive in my computer, it was detected as a DVR-106D. Pioneer does not even list such model as an OEM replacement for the A06U in its web site. So did I get a cat for a dog? Any feedback would be appreciated.

— MEL CHAVARRIA

THE DOG RESPONDS: The Dog spoke with a Pioneer spokesman who confirmed that the DVR-106D is the OEM version of the retail DVR-A06U. "Manufacturers that purchase drives from Pioneer and resell them actually have their own hardware warranties, so the customer needs to check with the web site or reselling manufacturer about the warranty terms for those OEM drives," said the spokesman. In short, that means you somehow got a drive that identifies as an OEM drive in the firmware.

The question is, What drive did you expect and what did you pay for? The Dog checked AccuPC.com's web site and found that the store offers a "retail boxed" DVR-A06U on its front page. A sales rep at the store also told the Dog that the drive comes in a box and is the retail version of the drive. At press time, the Dog was unable to reach Mel to ask if he received the drive in a retail box or not. It's possible the drive is a retail version with firmware from the OEM version, but that's a long shot. Pioneer says that if it was a retail boxed drive and both the drive and packaging bear the Pioneer brand, then the full one-year warranty should apply.

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Yo Yo Dyne

DEAR DOG: I just received a letter from my bank stating that my $40 rebate from Cendyne bounced and I was charged a $4 fee. Now I'm out $44. My bank said it will automatically try to redeposit it, and if that bounces, I'll be charged an additional $7. I called Staples to get a phone number for Cendyne. The salesperson said he didn't have a phone number. But he read a memo that Cendyne went bankrupt and Staples has pulled all Cendyne products. Is there any chance of my rebate being honored? How can I get Cendyne to pay for my bank fees?

— ZACH LYMAN

THE DOG RESPONDS: Bad news, Zach. The Dog has confirmed that Cendyne shut its doors. The company didn't file for bankruptcy, however. It was put under a court-ordered receivership after one of its primary investors, TestRite, became skittish about the $15 million it was owed by Cendyne. All of the company's officers resigned, and the company is under the control of Rob Evans & Associates, which is looking to sell the IP and inventory to a new company.

A spokesman for Rob Evans & Associates told the Dog there's a strong probability that a new company will buy the name and assets. Part of the deal could also include ongoing warranty and support for Cendyne's products as well as its rebates. However, if no one bites, all the assets will simply be liquidated and consumers will get dust. The good news is that most of the drives Cendyne sold were repackaged drives by such companies as Lite-On and Pioneer. Firmware updates for those drives are easily found on the Internet.

So what did in Cendyne? To find out, the Dog contacted the former president of Cendyne, Mo Vahdati, on his cell phone. According to Vahdati the poor economy was partially to blame. Under these trying times, consumer-rebate rates are reaching unprecedented numbers. While previously as few as 20 percent of consumers applied for rebates, today it's more like 60 percent. Still, Vahdati told the Dog, Cendyne would have weathered the storm, until TestRite engineered a hostile takeover. Vandati said he and other Cendyne officers intend to file suit against TestRite for alleged unfair business practices, conflict of interest, and breech of contract. "We are confident the judge and jury will fully redress this terribly callous injustice," said Vahdati.

So is it safe to buy the Cendyne products still on store shelves? Only if you're comfortable with what you're getting—no warranty and no product support.

Cendyne's fate as an optical and hard drive vendor is in limbo while the company is in receivership.

> ***"WE ARE CONFIDENT THE JUDGE AND JURY WILL FULLY REDRESS THIS TERRIBLY CALLOUS INJUSTICE."***

A Feel-Good Story

DEAR DOG: I know you get a lot of complaints about poor technical support and customer service. On Friday night, our house was struck by lightning. The APC power supply I recently purchased gave its life to protect my system. I e-mailed APC tech support and asked if there might be a way to reset the unit, as it was giving me a "No Ground" error. The next day tech support replied, asking for my address. By Sunday afternoon I received another reply telling me a new unit was being sent on Monday, and asking that I return the dead supply in the box provided. The new unit arrived Thursday. APC picked up the UPS charges. All I had to do was take the old unit to a UPS center. I did not ask for a replacement, but because of the fine support, I will be buying more APC power supplies.

— BILL ANTONIAK

Got a bone to pick with a vendor? Been spiked by a fly-by-night operation? Sic the Dog on them by writing **watchdog@maximumpc.com**. The Dog promises to get to as many letters as possible, but only has four paws to work with.

RECALL ALERT

It's déjà vu all over again. IBM and Lite-On are voluntarily expanding a previous recall of monitors that may overheat, smoke, and create property damage. Last March, IBM recalled some 56,000 15-inch touch-screen CRT monitors manufactured between June 1997 and September 1997. A circuit board in the monitor can overheat and become a fire hazard. IBM originally received reports of five monitors going up in smoke. The original recall involved G51 and G51t monitors with the following model numbers on them: 6541-02N, 6541-02E, 6541-02S, 6541-Q0N, 6541-Q0E, and 6541-Q0S.

The expanded recall, which adds another 63,000 monitors, includes the original model numbers listed above but now includes all monitors manufactured between June 1997 and December 1998. Monitors made outside of the date range are not on the recall list. The bad monitors were made in China, Malaysia, and the United Kingdom.

Consumers with the suspect monitors should call IBM's repair center toll free at 866.644.3155 between 9 a.m. and 7 p.m. eastern time, Monday through Friday. The repair center will verify whether the monitor is bad. Those with bad monitors will receive a free inspection and repair or replacement of the monitor. More information is also available at **www.pc.ibm.com/g51recall/**. IBM said some 700,000 of the monitors were produced. About 377,706 could go up in smoke. Of that, 118,098 were sold in the United States.

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Ask the Doctor

Symptom ▶ Diagnosis ▶ Cure

SOMETIMES IT STARTS, SOMETIMES IT DON'T

I recently upgraded my CPU from an AMD XP 1900+ to a 2400+. It runs great at the proper speed, and the BIOS (upgraded as well, along with the chipset drivers) recognizes it for what it is. The trouble is, it doesn't always boot on the first attempt. Sometimes it does, but sometimes it takes a "reset" or two or three before it starts. The fans and the neon light come on, the disc drives flash, but the monitor is a blank screen.

—MICHAEL HALL

There are a few places you should check. The first is your BIOS. Do you have the *very latest* BIOS rev available for your motherboard? You should also find out whether your board even supports the 2400+ proc. Although it might not seem like much to go from a 1900+ to 2400+, you are going from a CPU clock speed of 1.6GHz to 2GHz. That's a hefty clock-speed increase, and the latest BIOS is necessary to support the CPU. It's also possible that the increased requirements of the CPU are too much for your power supply, especially if your power supply is of questionable integrity.

WINDOWS XP LICENSES FOR EVERYONE

Can I install Windows XP on two of my home computers, or do I have to purchase two installation disks?

—LIPLIP90

Unfortunately for consumers, Microsoft's licensing rules for Windows XP allow the OS to be installed on only one machine at a time. However, if you already have a copy of XP and want to upgrade another machine, you can save a few bucks by buying an extra license, without the CD and manuals. You can order additional licenses for XP Home and Professional at http://shop.microsoft.com/. A Home upgrade costs $84, and a Professional upgrade costs $184.

SHORT SPEAKER WIRES

I bought the Logitech Z560 speakers about a year ago, but I've never been able to get the rear speakers to the back wall of my computer room. The rear speakers are attached with puny 6-foot speaker cables that are hard-wired to the speaker themselves—so I can't even buy more speaker cable to make it reach.

Is this problem endemic of all Logitech speakers? Can I save these speakers?

—CHRIS PAPAS

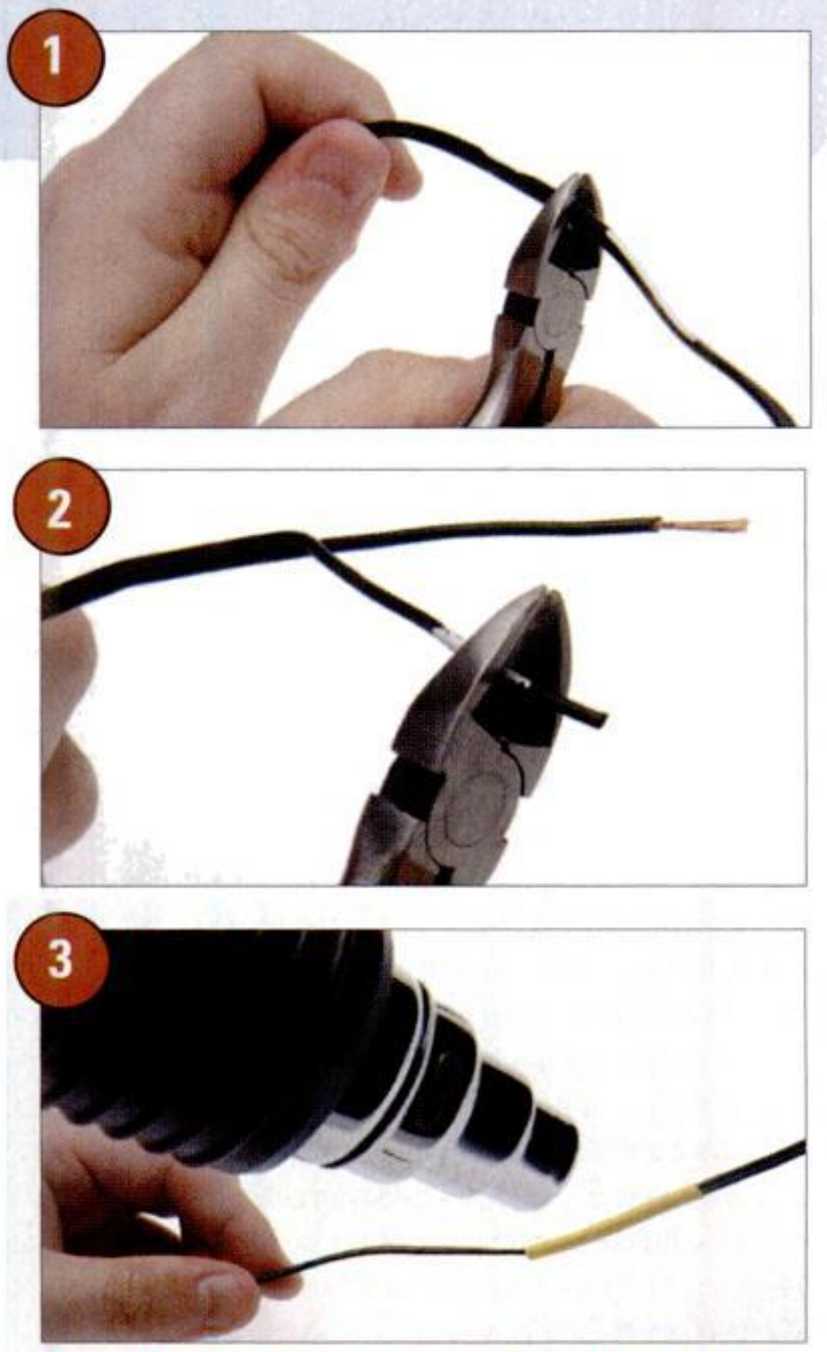
Short speaker wires plague most companies' cheapo speakers, including Logitech's. More expensive speakers usually boast longer speaker wires with at least one standard end, so you can simply splice another section to your wire for easy lengthening.

If you can't extend the speaker wire at either the satellite end or the subwoofer end, your only option may be to cut the wire and splice in a new segment. You'll need a pair of wire snips, a spool of speaker wire that matches the gauge of the wire you're extending, and something to seal the ends together. We like to use shrink wrap, but electrical tape works fine too. First make sure you are able to distinguish between the two wires that make up the speaker cable. You don't want to accidentally switch the polarity when you attach the new speaker wires. Next, snip the cable and pull the two wires apart [figure 1]. Strip the last quarter-inch of shielding from each of the wires [figure 2].

Before you go any further, position the shrink wrap on your cable. First, slide one piece of shrink wrap onto the end of the existing speaker cable, and another piece of shrink wrap over each individual piece of wire. Twist each of the two wires from the new cable segment onto its corresponding mate in the existing segment, making sure the polarity of each wire is matched.

Once the wires are twisted together, slide the individual pieces of shrink wrap over their splices, and apply heat with a hair dryer or heat gun until the plastic shrinks and forms a secure seal. Then slide the third piece of shrink wrap (the one you slipped over the end of the cable as a whole) over all the individual shrink-wrapped splices, and heat until it forms one cohesive unit [figure 3]. Repeat for each speaker wire you need to extend.

We recommend that you not cut and splice the cable of the speaker that houses the control pod. That cable often includes wires that control the power to the speaker system. A short on those wires could destroy your speakers or cause a fire.



Sometimes the only way to lengthen a short speaker wire is to cut it and splice in a new section.

HOW HIGH CAN I GO?

I have a home-built machine with an Athlon XP 1900+ Palomino processor. I want to beef up the rig for *Half-Life 2*, so I want to know what processor I can safely swap out to. Can I jump to an Athlon XP 3200+? I'm planning to also add a GeForce FX 5900 Ultra.

—BRIAN MCLAUGHLIN

The answer to your question depends on the chipset and motherboard you have, not the processor. Since the Athlon 3200+ requires 400MHz bus support, your choices are limited to boards using nVidia's nForce2 and nForce2 Ultra, and VIA's KT600. Your board likely supports just 266MHz or 333MHz CPUs. The fastest 333MHz Athlon available is Athlon XP 3000+ running at 2.167GHz. It uses the "Barton" core and has 512KB of L2 cache. The fastest 266MHz CPU is the 2600+, which has only 256KB of L2 and runs at 2.13GHz. Find out who makes your motherboard and which version of the of the board you have, e.g., Rev 1.2, and then visit the maker's web page to see which CPUs the company has approved for the board. If you update the CPU to something

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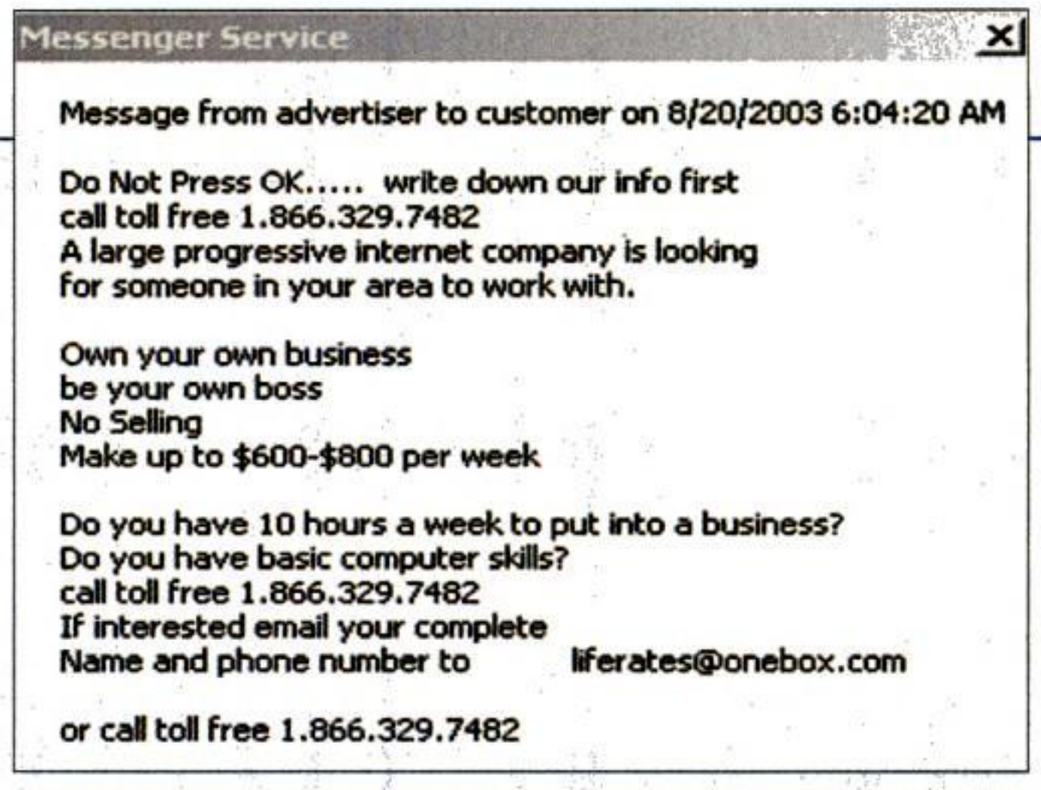
KILLING THE MESSENGER

I keep getting a spam pop-up on my desktop. I have a cable connection, so I'm hooked in 24/7. I have *Norton Internet Security Professional* (firewall, virus protection, etc.). I use the latest versions of *TrojanHunter, Spybot, SpySweeper,* and *Ad-Aware* all the time. Nothing seems to stop the pop-ups. Any ideas? Thanks!

—MARK FEATHERSTON

You've got the right software installed, Mark, but you must not have it configured properly. You need to configure your firewall to block access from ports 135, 137-139, and 445 of your Internet connection. By default, the *Norton* firewall should block the necessary ports, so you may need to adjust your settings.

Alternately, you can right-click My Network Places, select Properties, then select the network adapter that connects to the cable modem. Uncheck "Client for Microsoft Networks" and click "OK." This will disable Microsoft networking on that network card, and block Messenger pop-ups.



Annoying Messenger pop-ups can be completely avoided by installing even a rudimentary firewall.

hotter, you should consider a more efficient heatsink as well.

WHEREFORE ART THOU, PARALLEL PORT?

I recently recommended a Dell laptop to a friend. When the laptop arrived, it didn't have a parallel port to plug his printer into. Other than buying a new printer that uses USB, is there another way he can use his existing printer with his laptop?

—JEFF MOORE

We're seeing more laptops shipping without legacy ports every day. The best solution for your friend is to buy a USB-to-parallel adapter. The adapter will connect to his laptop's USB port and add a parallel port to the PC. We haven't yet tested the Belkin F5U002, but we've used earlier Belkin USB adapters to connect older printers to new PCs without any problems.

CPU X TWO?

I was told that if you have dual CPUs, you can dedicate certain processes to each CPU. I was wondering if this would work for Intel's Hyper-Threading technology. Can I set background processes to run on the virtual second CPU, and everything else to run on the primary CPU? Would this boost performance? This is a major factor for me in deciding whether to go Intel or AMD.

—JASON CATANZARO

A dual-proc or HT-enabled machine indeed makes it possible to dedicate the affinity for processes and applications via Windows XP's Task Manager. However, keep in mind that Hyper-Threading is not the same as two physical CPUs. The single CPU still has the resources of a single CPU, it's just a little more efficient at doling them out when in HT mode. If you, for example, run two applications that both require the same functions of the CPU, the performance will be no better, and may even be worse, if the applications are not optimized for Hyper-Threading. On the other hand, if you run multiple applications that use different functions of the CPU, you can see quite an efficiency boost. HT isn't the magic bullet of computing, but it does work very well at some things.

A CASE OF COMPATIBILITY

I'm building my own computer and all I'm looking for now is a case. Is there a web site that lists case/motherboard compatibility?

—MIKE DITULIO

We don't know of an overarching case-compatibility web site, but we can tell you how to determine whether your case and mobo are compatible. The vast majority of PC cases and mobos available today are based on one of the variations of the ATX spec. In biggest to smallest order, the ATX spec includes extended-ATX, standard-ATX, mini-ATX, and micro-ATX. Any smaller board that conforms to the ATX spec will fit into a larger case—for instance, you can put a micro-ATX board into a standard-ATX case. However, you won't be able to put a larger board in a smaller case.

AVI FILES WON'T PLAY

My problem is more about software than hardware. I'm trying to play .AVI files on my PC and all I get is the audio portion. The video screen remains black. I'm using XP Pro and the latest version of *Windows Media Player.*

—MR. KRABB

The most likely cause of your problem is a bad codec. You are probably trying to play a video file that uses a codec that's not installed on your system. We've seen this when trying to play back video recorded using a proprietary video capture card, or when using an older version of the DivX codec. The only solution is to update the codecs on the system in question.

If you don't know what codec the video uses, you can easily find out by right-clicking it and choosing Properties. The codec should be listed in the Summary tab. ■

Does your PC break down more than Mariah Carey? Never fear, the Doctor's here! If your PC's pushing you toward the edge, the Doctor can help. Send your perplexing PC problems to **doctor@maximumpc.com**, but remember, the Doc gets loads of e-mail, so he can answer just a fraction of submitted questions.

SECOND OPINION

CPU-SPEED RESET

Concerning Matt Garcia's question in the August issue about a CPU speed reset...

One of Windows' strange quirks is that sometimes when you tell it to shut down, it decides to reboot instead. It's common for users to inadvertently hit the restart button when they in fact mean to shut down, and when this happens, most everyone does the same thing: We wait for POST to start, then hit the power button.

Here's the problem: BIOS vendors have begun adding checkpointing to the POST code. Thus, it will detect that the machine failed to make it through the POST process, but it can't tell if the failure was caused by an incorrect setting or someone hitting the power button. So, the BIOS responds by resetting all the CMOS settings' known safe options, usually represented by the lowest clock settings, etc. The next time you go into the BIOS, you'll get a nice warning message stating that safe mode defaults were used due to a POST failure.

—MITCH BROWN

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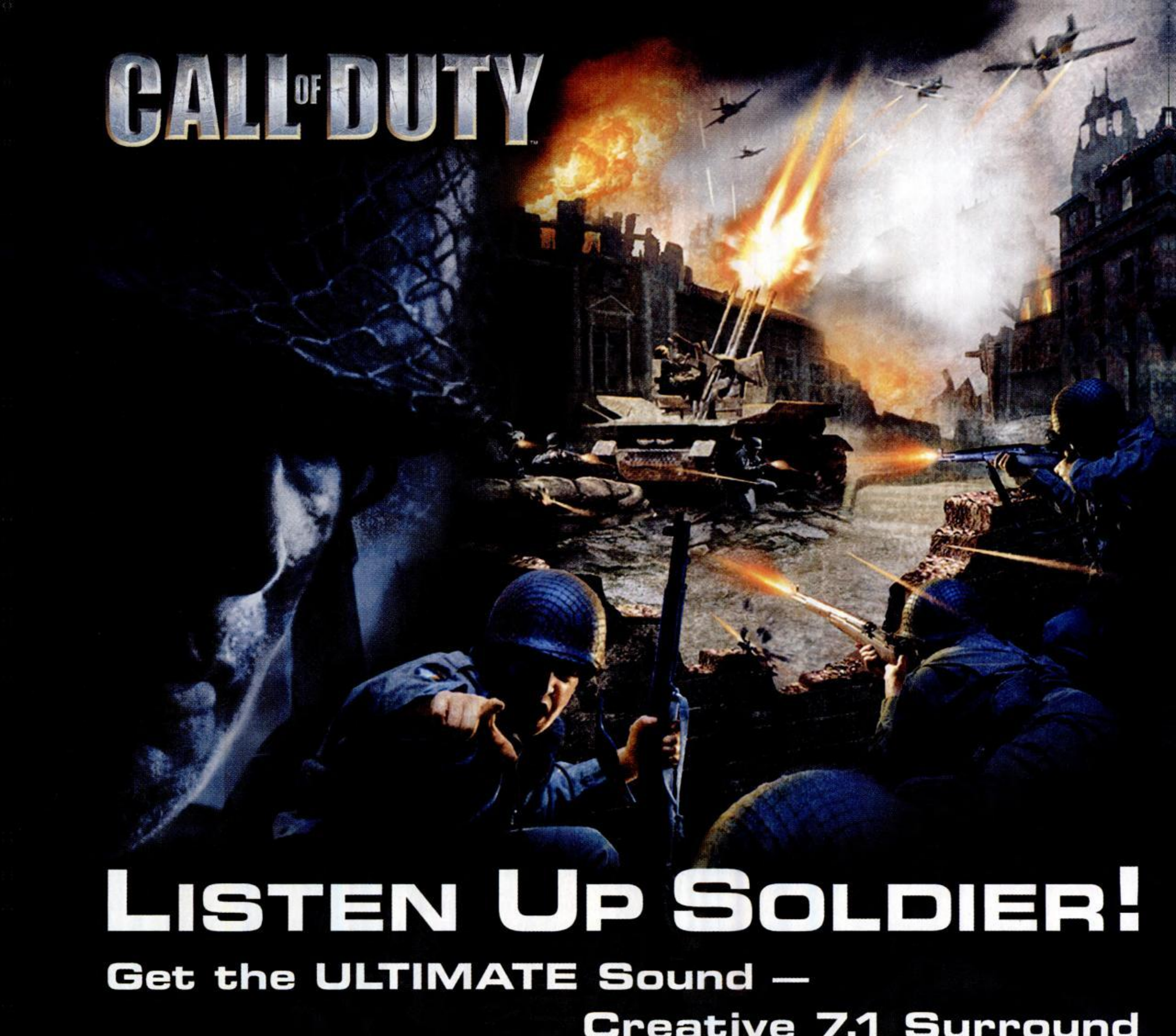

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Build Your Own...

Entertainment Center PC

Imagine a single PC that can replace your home theater system, TiVo, game console, and stereo. Here's what to buy, and how to put it all together. BY WILL SMITH

You're sitting in your living room. A gigantic flat TV dominates the far wall. Speakers surround you. In your hand is a single remote control, and it's the only thing you need to access more than 200 hours of recorded TV programs, 600 hours of music, all your favorite games, and a DVD player to boot!

You heard us right. A single PC can do everything your DVD player, TiVo, CD jukebox, VCR, and game console can do. Shoot, it will even let you surf the web and run spreadsheets right from the comfort of your couch! In this article, we show you how to build it—the *ultimate* entertainment center. You just need a few specialized parts to pull it all together:

- A case that's small, quiet, and attractive enough to integrate with your living room's feng shui.
- A CPU and motherboard that are fast enough to do on-the-fly video encoding and decoding. You'll want a machine that's 2GHz or faster, whether it's AMD- or Intel-based.
- A videocard that excels at 3D gaming.
- A TV tuner to pull signals from the airwaves, cable, or satellite (such a tuner might already be on your videocard).
- An optical drive that can play and record DVDs and CDs.
- The biggest, fastest, and *quietest* hard drive you can find for movie and music storage.
- A gigantic, big-screen display appropriate for TV, movies, and games.
- A surround-sound speaker rig that will blast the audio from your movies, CDs, MP3s, and games in full 5.1 glory.
- Input devices to let you fully control your system without leaving the couch. You'll need a wireless mouse and keyboard for general computing duties, and a wireless gamepad or two for couch-based gaming.
- Software for maximum playback compatibility. At minimum, this means DVD playback software, an MP3 jukebox, and TV recording software.

In the very next section, we give you general purchasing tips for each of the main components in the entertainment PC. We also show you exactly which parts we picked, and tell you why we chose them. After this, we show you assembly instructions, and give you a quick tour of the software that runs our rig.

In the not-so-distant future, we expect to see a number of consumer electronics devices that promise to do everything that our entertainment PC already does with aplomb. Want to stay ahead of the technology curve? Good. Your instructions unfold on the next 10 pages.

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A 32-inch plasma display anchors our entertainment PC project.

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Picking the Best Case

Selecting the right case is crucial. Not only must your case accommodate all your components, it also has to integrate with your living room décor. After all, you won't want a boring beige PC sharing space with all your sleek-looking Scandinavian furniture. When choosing your PC entertainment center case, consider size, capacity, noise output, and style.

SIZE: All things being equal, small cases are better. The last thing you want is a gigantic PC case dominating your living room, and stealing attention from the Picasso hanging over the fireplace. Plus, one of the goals of this project is to ditch the clutter created by multiple traditional entertainment devices (TiVo, DVD player, home stereo, etc.), so you'll want the most innocuous case possible.

CAPACITY: Small is better, yes, but make sure the case you buy can accommodate all the components you'll need for the project. Study the interior of any potential purchase, and make sure it has a sufficient number of slots and bays.

NOISE OUTPUT: This rig is going in your living room. You'll be using it to watch DVDs and TV. Do you want the hum of fans to disrupt the quiet moments of tense psycho-thrillers? No. So do your homework, read product reviews, and pick a case with a modest complement of noisemakers (fans), and a reputation for being quiet.

STYLE: Hey, this is your call, baby. We simply advise you to look at your entertainment center's peripherals (display and speakers), and then buy a case that fits with their aesthetic presentation. Keeping in mind all the above criteria, you'll have to decide between a standard ATX case and a small formfactor bare-bones PC kit (these kits typically come with a very small case and a preinstalled motherboard and power supply).

Today's case market is flooded with different ATX enclosures, from tiny micro-ATX boxes to full-tower behemoths. Because there are so many options, you'll probably find the perfect case if you go the ATX route. Another benefit to ATX cases is that their parts are standard, so you can easily and confidently replace noisy power supplies and fans with quieter models. But the main strength of ATX cases is their interior capacity. Most ATX cases have several slots for 3.5-inch and 5.25-inch drives, and plenty of open PCI slots.

Most bare-bones mini-PCs are very small and quiet, but come with fewer drive bays and PCI slots. There are also just a handful of bare-bones mini-systems to choose from. If you go the mini-PC route, you'll be adding a CPU, memory, videocard, optical drive, and hard drive to the motherboard that

OUR CASE PICK: Shuttle SN45G

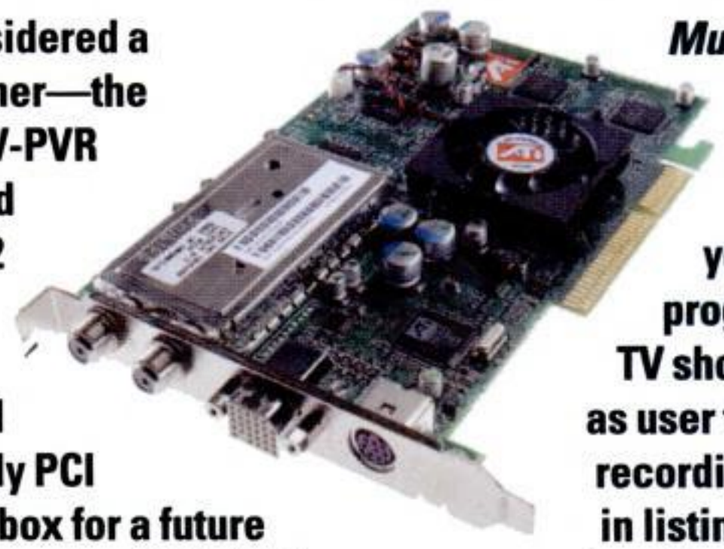
Regular readers of the magazine already know we love Shuttle's line of bare-bones systems. They're small, totally unobtrusive, and quiet. Their only drawback is limited expansion opportunity, but that's not a worry for us, because our particular project is being built as a dedicated entertainment center PC—we don't expect to be adding many components in the future (if at all).

We chose the nForce2-powered SN45G. With a CPU heat pipe and "smart fan" technology, it runs very quietly. We were most impressed, however, with the nForce2 chipset's integrated sound, which can encode the DirectSound3D output from any game into a Dolby Digital 5.1 stream. Because the chipset essentially handles all the audio playback duties we would want from an entertainment center (DVD, MP3, and gaming audio, specifically), we're able to save the Shuttle's lone PCI slot for future expansion.

We paired the SN45G with an Athlon XP 3000 processor and 512MB of DDR memory. While we could have picked up a 3200 processor, the 3000 is about half the price of the 3200, and superlative CPU speed isn't too important for an entertainment PC. We review the Shuttle SN45G on page 88.

www.shuttle.com, $329

OUR VIDEO PICK: ATI All-in-Wonder 9600 Pro



We seriously considered a stand-alone TV tuner—the Hauppauge WinTV-PVR 350 has an onboard hardware MPEG-2 encoder and produces beautiful images—but we'd rather save the only PCI slot in our Shuttle box for a future upgrade. So we turned to ATI's All-in-Wonder 9600 Pro.

The All-in-Wonder 9600 Pro adds a TV and FM tuner to the standard Radeon 9600 Pro package. In addition to great DirectX 9 gaming performance, the card ships with software that adds PVR functionality as well as PVR-like features for FM radio. That's right: The latest version of *Multimedia Center* (ATI's custom TV/DVD/PVR software) lets you record FM radio programs just like TV shows. It's not quite as user friendly as TV recording (there's no built-in listing program) but we love it nonetheless.

If you're wondering why we eschewed the All-in-Wonder 9800 Pro for the slightly less game-worthy 9600 Pro, it's because we've heard reports that the 9800 doesn't play nice with the Shuttle's power supply. The 9600 Pro is less power-hungry than its faster brother.

www.ati.com, $250

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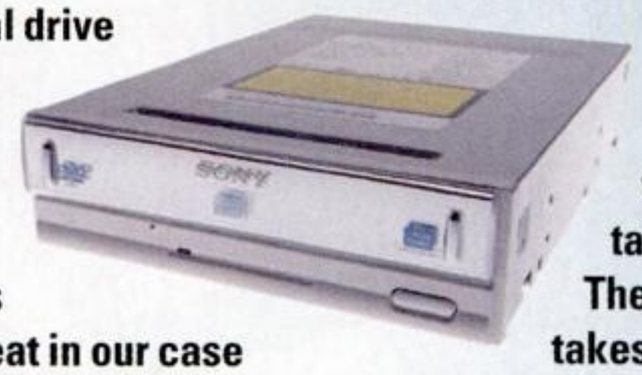
OUR DVD DRIVE PICK: Sony DRU-510A



Because we decided to use a Shuttle case with a sole optical drive bay, we absolutely required a drive that can burn anything—and fast! The Sony DRU-510A perfectly fits the bill, and it looks great in our case to boot. With quick 4x DVD burning for DVD-R, DVD+R, and DVD+RW, we have no reason to complain about the 510A's DVD burn times. Its CD burning times are a little slow compared with those of stand-alone burners, but a 24x burn speed is more than adequate for a home entertainment box. Dig: The Sony burner takes less than five minutes to burn a full CD at 24x. It also rips tracks from audio CDs at up to 40x, which is nearly as fast as dedicated CD-RW drives.

www.sony.com, $280

comes with the case.

Though mini-systems don't offer many opportunities to install extra components, what you lose in flexibility, you make up for in quietness and size. Most bare-bones PCs have just one or two fans and a much smaller physical footprint than even the smallest ATX cases. And because bare-bones boxes are completely proprietary, some manufacturers even toss in spiffy special features, such as FM tuners and remote controls.

Picking the Best Videocard & TV Tuner

In addition to running the most demanding 3D games, our videocard choice must be able to handle personal video recorder (PVR) functionality. An off-the-shelf PVR, such as TiVo, performs three basic tasks: (1) It records TV shows to your hard drive (kind of like a VCR); (2) it provides an intuitive menuing system that makes it easy to pick programs to watch and record; and (3) it lets you pause, rewind, and fast-forward whatever you're watching.

Our home entertainment PC will do everything that a commercial PVR does, but it requires specialized hardware to work well. Naturally, to watch TV on your PC, you'll need a TV tuner and PVR software. On the tuner front, you have two choices—you can buy either a stand-alone PCI tuner card or an AGP videocard with an integrated TV tuner.

First, you should know that adding a TV tuner to an AGP videocard usually adds about $50 to the total cost of the card. If you have a small case, or limited PCI slots, you might want to consider an AGP card with an integrated tuner. However, if you frequently upgrade your videocard (because you always want to run the fastest 3D as soon as it's available), you should consider buying a stand-alone PCI TV tuner card. This way, your PVR solution will remain a constant while you periodically upgrade your 3D gaming AGP card.

Whether it's stand-alone or integrated, your TV tuner should produce a clear, crisp image that's indistinguishable from what you'd see on a normal TV. The tuner should change channels as quickly as a normal TV, and should come with basic software to let you watch TV and do basic PVR duties.

Please note that we use the phrase "basic PVR duties." For our project, we're augmenting our TV tuner with specialized software that handles traditional PVR operation, but also lets us stream TV content (live or recorded) from our home entertainment PC to any other PC on a network. TiVo can't do that!

We're avid gamers at *Maximum PC*, so our video solution will absolutely require full DirectX 9 support as well as support for video output to an HDTV.

Picking the Best Optical Drive

Flexibility is the key here. For an entertainment center PC, you shouldn't have to buy more than one optical drive, so the one you do buy should be able to read and write DVD-R/RW, DVD+R/RW, CD-R, and CD-RW. This means you'll be investing in a dual-format combo drive ("dual-format" meaning the drive can handle both recordable DVD standards, and "combo" meaning the drive can read and write both CDs and DVDs).

Furthermore, your optical drive should be able to burn all types of discs at a decent speed. For most combo drives,

(continued on page 32)

Write your own wedding vows.

(continued from page 31)

the limiting factor isn't DVD burn times, because most dual-format combo drives burn all their DVDs at 4x. No, the problem is that most combo drives have downright pathetic CD burn times. We don't like having to wait 18 minutes to burn a single audio CD at 4x, so we recommend that you stay away from any dual-format combo drive that burns CDs slower than 24x.

Noise is also a factor. A good drive will silently play DVD movies. Nothing's more distracting than a loud DVD drive buzzing in the background during quiet scenes.

Picking the Best Hard Drive

Your entertainment center PC's hard drive should be high-capacity, quiet, and reasonably fast. For PVR duties, a 5400rpm drive is totally sufficient, but for games, we prefer the faster access times and data transfer rates that a 7200rpm drive provides. That said, Western Digital's new 10,000rpm SATA drive is overkill for a home entertainment PC, if not also too noisy and too limited in capacity. We think 7200rpm drives offer the perfect balance of performance and noise-reduction, and they're available in a wide variety of capacities.

We'd never buy a drive smaller than 150GB for a home entertainment PC. The drive will need to store TV-quality MPEG-2 video (which eats about one gigabyte of drive space per hour), Windows XP, all your games and applications, and what we expect will be many gigs of digital music. Bigger is definitely better!

Also remember that this machine will run around the clock, and the drive will be spinning most of that time. You don't want a loud drive spinning when you're trying to nap on the couch or listen to Enya, do you? The trick is finding a large-capacity, 7200rpm drive that's also quiet.

Picking the Perfect Display

Your entertainment PC will be multi-tasking among DVD movies, 3D games, TV watching, and maybe even some web browsing, so it's inevitable that your display will have to make some compromises. That said, you'll absolutely, positively, want a display that can show high resolutions. Whether it's an HDTV—capable of displaying resolutions up to 1280x720—or a large PC monitor, is up to you. Just make sure your display supports both of the high HDTV resolutions, 1080i and 720p. Most HDTVs only support one or the other, but not all HD programming is available in both resolutions. Please don't use a normal NTSC TV. It will only display resolutions up to 640x480, which is too low for today's computer content.

Normal NTSC televisions—the current analog standard—have an aspect ratio of 4:3. This means that for every four horizontal inches of screen real estate, the screen boasts three vertical inches. But HDTVs come in two different aspect ratios, the standard 4:3 or a wider, flatter 16:9. Most HD programming is recorded at 16:9. And because 16:9 is close to the 2.35:1 ratio that most movies are shown at, DVD movies fill more of the screen of a 16:9 display (at least compared with a 4:3 display). For those reasons, we recommend purchasing only a 16:9 display.

Your display should be able to show games without any of the annoying streaking that comes from low pixel response times. You should also look for displays with multiple inputs. We consider it vital to have a pair of HD-ready component inputs, two or three non-HD component inputs, and a wide assortment of S-video and RCA composite inputs. Inputs for a PC—whether they're analog DB-15 plugs or digital DVI connectors—are definitely welcome, but not required. If you use the right videocard, it will drive your display with an HD signal that the set will understand. We also recommend you purchase a display that won't succumb to burn-in (some technologies will leave ghost images on your display if you leave a static image onscreen for an extended period of time). And your display should of course be as large as possible, your floor space and budget permitting. We're looking for a home theater experience, after all.

Now it's time to touch on the most popular large-screen technologies that you'll encounter as you shop around.

PLASMA FLAT PANELS: First things first. Plasma displays don't leak, despite whatever you may have heard. And even if they did, there are only trace amounts of gas in the entire display, and any leaking gas wouldn't hurt anyone or catch on fire.

Plasma displays work great as both TVs and monitors, and they come in massive sizes, up to 60 inches diagonal. Best of all, plasma displays are just 4-inches thick, and can be hung on the wall. In normal TV-viewing situations, plasma displays don't suffer from burn-in. Their only problem is high cost (most start around $4,000), and less than totally-black black levels.

Top resolutions vary from set to set, but they should at least be able to display a 1080i HD image and 1024x768 desktop display. Because a plasma display generates an image by electrically exciting small quantities of inert gas trapped in one of many thousands of cells, plasma displays have a fixed maximum resolution based on the number of cells on the display.

Plasma is very well suited for TV and movie viewing, but due to the threat of burn-in, may not be ideal for gaming and web surfing, where static elements are constantly on the desktop. That said, we've never experienced plasma burn-in ourselves.

LCD FLAT PANELS: Advances in LCD technology have allowed manufacturers to create otherwise-traditional flat-panels that are larger than 30-inches diagonal. LCDs don't burn in, and are cheaper than comparably sized plasma displays. But LCDs can suffer from low pixel response rates, so make sure you test some games on any display before purchasing. Whether you hang it on the wall, or set it

OUR HARD DRIVE PICK: Western Digital WD2500

We wanted 250GB for our entertainment center PC, and that's how much we got. The Western Digital WD2500 is the last of the great parallel ATA hard drives. With a spindle speed of 7200rpm, the WD2500 is more than fast enough for our entertainment rig, but quiet enough that we won't notice it when watching *Night Gallery* reruns. We considered quieter 5400rpm drives, but decided they weren't quiet enough to warrant a performance loss.

www.westerndigital.com, $250

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on a stand, the perfect LCD display can serve you well. In fact, the pricing on LCD-based HDTVs has come down so far, they are emerging as the best value for PC-based entertainment centers.

LCD panels have two main parts, a bright backlight and a grid of cells that can be opened and closed very quickly. Each cell, which corresponds to a single pixel, has three sub-pixels, one each for red, green, and blue. The display alternately opens the sub-pixels to create the right color combinations.

LCD sets come in different sizes, ranging from 15-inches to 32-inches diagonally. Maximum resolutions range from 1600x1200 for desktop monitors to the 1080i HD resolution. Because the max resolution of the display is dependant on the number of cells on the panel, LCD displays support only one native resolution. Newer LCD displays are well suited for gaming, web surfing, movie viewing, and TV viewing.

REAR-PROJECTION CRTS: If you want to get a giant TV on a budget, a good rear-projection TV can be of service, but it's not ideal. Rear-projection CRTs are notorious for burn-in problems. Furthermore, rear-projection sets have poor viewing angles, so unless you're sitting right in front of one, you may have trouble. Also, very few rear-projection sets support PC resolutions, so you'll have to use a videocard capable of outputting HD resolutions. And don't expect to hang a rear-projection set on the wall, either. Most weigh more than 200 pounds, and dominate whatever room they're in. You'll have a hard time sneaking one of these past your wife.

Rear-projection CRTs' resolution tops out at 1080i, but unlike LCD and plasma displays, they can run lower resolutions without interpolation. CRT-based rear-projection sets use three tubes, similar to normal TV sets, which represent each of the primary colors. The images from these tubes are combined using mirrors and lenses, and projected on the rear of a large screen. Rear-projection sets are better suited for TV and movie viewing than gaming and web surfing because of their propensity for burn-in.

FRONT-PROJECTION LCDS: Nothing looks better than the image a good projector throws onto a giant white background. The right projector can give you a larger screen size than just about any other display technology, and LCD projectors are cheaper than plasma and LCD monitors (at least in respect to the amount of screen real estate for every dollar spent). LCD projectors work by shining a very bright light through a transparent LCD screen, and focusing the resulting image on a screen. Unfortunately, most LCD projectors are poorly suited for day-to-day use. First, their bulbs cost several hundred dollars and are good for just a few thousand hours. Second, most LCD projectors aren't bright enough to be used in anything but a dark room.

Front-projection LCDs project images using a similar technique to LCD monitors. They use a smaller LCD panel with a finer grain, a much brighter light, and a series of lenses and mirrors to focus the image on a screen. Maximum resolutions for most projectors top out at 1280x1024, although we have seen higher-resolution screens. The main problem with any type of projector is bulb life. No one wants to replace an expensive projector bulb after every 3000 hours of viewing time.

FRONT-PROJECTION DLP: A high-res front-projection rig can give you a larger, prettier picture than anything short of a

(continued on page 35)

OUR DISPLAY PICK: Sony WEGA KE-32TS2

The 32-inch plasma WEGA represents a welcome balance between size, flexibility, and style. While we were initially tempted to buy a DLP projector and use a 150-inch screen that would rival the screens of many multiplexes, we opted for practicality instead. Besides, there's nothing quite as sexy as a 16:9 TV you can hang on your wall.

Unlike a projector, the KE-32TS2's plasma screen doesn't require new bulbs every few thousand viewing hours. It looks great in all but the brightest rooms, and has appropriate inputs for a PC. It supports a maximum resolution of 1024x852 and works with either 720p or 1080i HDTV signals.

www.sony.com, $4000

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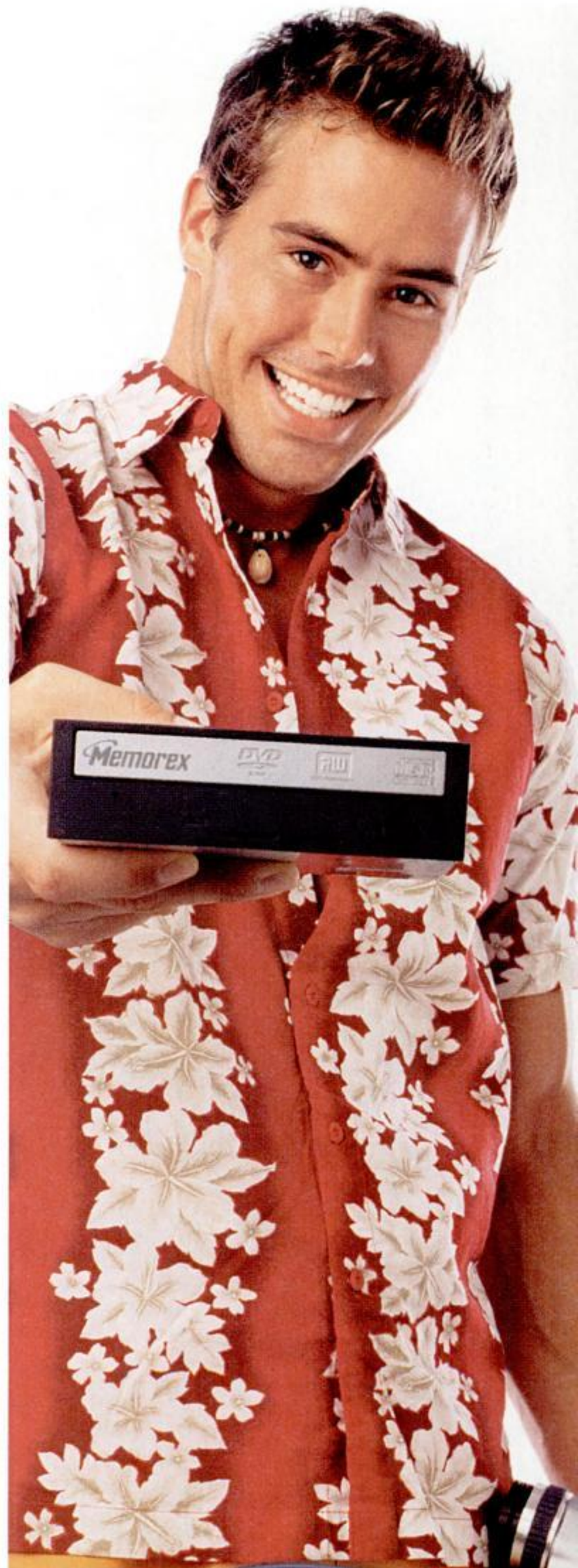

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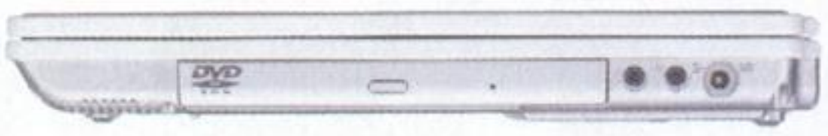

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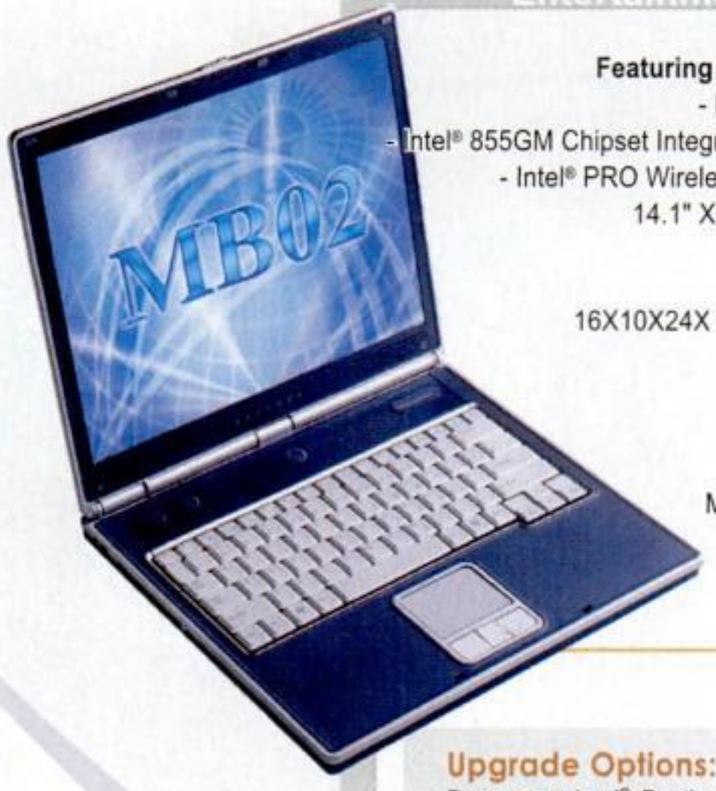

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OUR SPEAKER PICK: Klipsch Ultra 5.1

More of a good thing is always better. Case in point, the ProMedia Ultra 5.1s. The original ProMedia 5.1 system's side-firing dual 8-inch subwoofer produced so much bass it would knock pictures off the wall. Klipsch one-upped its own act with the new Ultra system. The sub is so bass-thumpingly loud that it knocks the pictures off the wall, then replaces them on the next beat. Seriously, the new Ultra rig features a redesigned subwoofer—perfect for replicating the crushing bass in today's ultra-loud action movies—and tweaked satellites. We're also especially fond of the new control panel, which we nestled up against our Shuttle box.

www.klipsch.com, $400 (see page 98 for review)

(continued from page 33)

film projector. When paired with a large screen in the right room, a DLP front projector can create a movie theater–size image in your home. DLP projectors take advantage of a scaled-down version of the same technology used for digital projection at the movies. Essentially, they create an image by reflecting different colors of light off thousands of tiny mirrors embedded on a chip. Unlike an LCD projector, which filters some of the light from the lamp, DLP projectors reflect every bit of light the lamp puts out. This provides a clearer, brighter picture with longer-lasting, dimmer lamps than those used in LCD projectors. If you're going to buy a projector for a home theater, DLP is the one to get.

The maximum resolution a DLP projector supports is entirely dependant on the number of mirrors embedded on the DLP chip. Each tiny mirror corresponds to a single pixel. Maximum resolutions on DLP projectors reach up to 1600x1200 and 1080i. Like LCD projectors, the main drawback is that the bulbs are expensive and have a short life.

DIRECT VIEW CRTS: What we're talking about here are traditional TVs. They're big, bulky, and based on the exact same technology that let your parents watch *Leave it to Beaver*. Most large CRTs lack standard PC inputs, and those that have them cost almost as much as LCD displays of comparable size.

CRTs produce an image by shooting a beam of electrons at a glass tube coated with phosphors. When the electrons hit the phosphors, they light up.

Picking the Right Speakers

Don't kid yourself, Timmy: Your speakers are as important as your display. Without explosive surround sound and booming bass, your games and movies won't create suspension of disbelief. But, damn, are there a lot of speaker options to choose from. Ranging from $99 multimedia rigs to $10,000 home theater systems, it's difficult to pick just the right surround sound system. Luckily, the size of your room will help narrow your choices.

We would never consider a speaker rig with fewer than five satellites and a subwoofer for our home entertainment PC. Watching DVD movies and playing games that support DirectSound3D just isn't as satisfying without a good set of 5.1s. The rear channels add vital sound cues for action in movies and games, whether they're environmental sounds like crickets chirping and water dripping, or big explosions and tommy gun fire. The subwoofer handles all low-end sounds, adding even more punch to weapons blasts, machinery noises, and, of course, music.

So what's the difference between a 5.1 "multimedia speaker set" ostensibly intended to be connected to a PC, and comparably priced "home theater" speaker sets intended for grander applications? The answer is "quality"—but probably not the way you'd think. When we directly compared high-end 5.1 multimedia speakers with comparably priced 5.1 home theater speakers, we were amazed that the multimedia speakers were louder, clearer, and crisper. We can only assume it's because a $400 multimedia rig is at the top of its category, while a $400 home theater speaker setup is entry-level.

Unless you have a very large room or a room that you can blast with high volumes without complaint, a high-end multimedia speaker rig should meet your home entertainment needs. You'll also probably save some money.

(continued on page 37)

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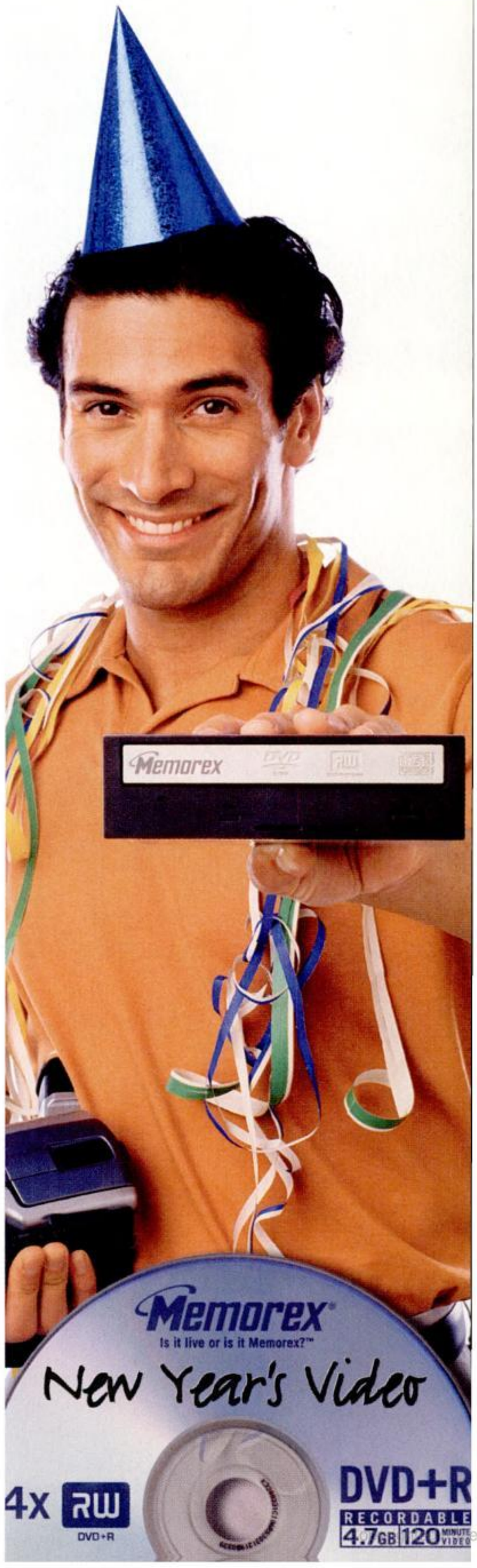

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OUR INPUT DEVICE PICKS: Microsoft Wireless Keyboard, Gyration Ultra Mouse, ATI Remote Wonder, and Saitek Wireless Gamepad

We decided to use a four pronged attack for our entertainment PC's input options. For standard keyboard duties, we dig the latest Microsoft Wireless Keyboard. Taking advantage of the 2.4GHz wireless spectrum and sporting the tilting scroll wheel that adorns Microsoft's new mice, the Wireless keyboard is perfect for couch web browsing and e-mail.

The mouse was a considerably more difficult choice. We initially planned to go with a trackball, but decided to use the Gyration mouse instead. By combining a standard optical mouse and an alternate mode that uses a gyroscope to sense the mouse's movements through the air and move the cursor accordingly, Gyration came up with the ultimate couch mouse.

Also, pictured here is the trusty ATI Remote Wonder. Its successor, the Remote Wonder 2 will be included with All-in-Wonder 9600 Pros by the time you read this. And our limited experience with the new model shows it to be every bit as good as the original. The Remote Wonder and Remote Wonder 2 sport basic controls for DVD, music, and PVR applications.

The Saitek P3000 Wireless Gamepad includes the requisite pair of analog joysticks, a standard D-pad, 11 buttons on its face, and two triggers. The wireless interface uses the 900MHz radio band for minimal interference. Best of all, it comes with a pair of rechargeable metal nickel-hydride batteries and a charger built into the base station.

- Microsoft Wireless Desktop Elite, www.microsoft.com, $105,
- Gyration Ultra Cordless Optical Mouse, www.gyration.com, $80
- ATI Remote Wonder, www.ati.com, ships with All-in-Wonder 9600 Pros, $50
- Saitek P3000 Gamepad, www.saitek.com, $40 (see page 97 for review)

(continued from page 35)

There are two main ways to connect your soundcard to your speaker rig: with several analog wires or a single digital connection. Digital signals are usually cleaner than analog signals, and are preferred for that reason. Unfortunately, not all PC soundcards speak the same language as PC speakers.

You see, to get a 5.1 signal (that's five satellites and one low-frequency subwoofer) from your PC to your speakers using the digital connection, the PC needs to send the sound stream encoded in a format called AC-3.

AC-3 is also known as Dolby Digital 5.1 and is one of the standards used for the audio encoded on DVDs and in some console video games. The problem is that most soundcards, including the popular Audigy and Audigy 2 from Creative Labs, can't convert the positional sounds that Windows apps and games send to the soundcard into an AC-3 stream that the speakers can understand. Instead, most soundcards send a simple PCM stereo stream from the soundcard, discarding the positional sound information. The one exception is the integrated sound in the nForce2 motherboard chipset from nVidia. It encodes Dolby Digital 5.1 on the fly, and will send an AC-3 signal to your speakers.

Whew, that was a mouthful. The practical upshot is that you'll want to use your speakers' analog inputs instead of the digital inputs. For most PC users, a speaker rig's optical ports and digital decoder will sit unused.

DVD viewing is a slightly different story. You could pass the Dolby Digital signal through your soundcard untouched and let a pair of digital speakers decode it, but we're comfortable letting our DVD playback software decode the audio track from the DVD to an analog signal. That way, we avoid having to manually change the input on the speakers anytime we switch from using Windows or playing a game to watching a DVD.

The only reason to buy speakers with a digital decoder is console gaming. The Xbox and PS2 both have support for digital sound output, and the Xbox will even output 3D positional sound in games.

(continued on page 38)

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(continued from page 37)

Picking the Right Input Devices

Finding a comfortable way to interact with your entertainment PC can make or break this project. After all, you won't have the "luxury" of sitting in an office chair staring straight ahead at a computer monitor, with a mouse and keyboard at arm's reach. Instead, you'll be forced into a comfy chair, maybe even with a cocktail at your side. Sounds plush, sure, but how are you going to position yourself for data entry, and will your mouse and keyboard cables even reach? The answer, of course, is that your mouse and keyboard must be wireless. You'll also want a wireless remote control for entertainment center tasks, and a gamepad for gaming.

There are two different wireless technologies used in most living rooms today—infrared and radio. Remotes that communicate via radio are preferred because they have greater range and don't require an unobstructed line of sight with their receiver. Most wireless PC peripherals transmit using radio (also called RF), and those that don't should be avoided.

When you're picking a wireless keyboard and mouse, your main criteria should be comfort and battery life. Make sure you take a test drive of your keyboard and mouse before making a purchase (most CompUSA and Best Buy stores have floor models available for that purpose). Also, for navigating desktops while sitting on a couch, we recommend mice that don't require a flat surface. In other words, don't think wireless mouse—think wireless trackball or something more exotic.

Gamepads are vital for proper couch gaming. Game consoles were designed for the living room, and most console-style games are best played with gamepads. Make sure your pad has two analog joysticks, an eight-way digital D-pad, and the assortment of buttons and triggers you'll need for today's complex games.

Finally, a good remote control is imperative for operating your entertainment PC's TV, DVD, and music playback features. There isn't a standard for PC remote controls yet, so you'll have to make sure your remote is compatible with all the software you want to use. That said, there are a few things that all remotes should have: rudimentary mouse controls, basic video playback controls, shortcuts for all your frequently used media apps, and a numeric keypad to quickly switch TV channels.

Picking the Right Software

Your entertainment PC serves four basic functions: It plays DVDs, music, and games, and handles all your TV recording and time-shifting needs. Naturally, to do all this, it needs the right software.

Most videocards include DVD playback software, but not all software DVD players are created equal. We expect any good player to decode Dolby Digital 5.1 sound and output positional audio using a 5.1 soundcard (or chip). The player must also be able to display widescreen movies at their correct aspect ratio on 16:9 monitors (some players incorrectly stretch the image on 16:9 monitors) as well as on standard 4:3 monitors.

Your entertainment PC's PVR software must make it easy to choose programs to watch and record. This means that it will display regularly updated show listings for all the channels you receive. It should also let you pause, rewind, and fast-forward live TV. Finally, every aspect of your PVR software should be easily controlled using your remote.

You'll also need at least a rudimentary jukebox program to help you manage your digital music collection. You should be able to select playlists as well as stop, start, and change tracks with the remote. We don't expect you to be able to create and organize your playlists with the remote, but that's definitely a nice feature. Your jukebox software should also include software that will let you rip new CDs to MP3 or WMA files.

Finally, you'll need some good games. But we don't think you need us to tell you the whys and hows of that particular subject.

OUR SOFTWARE PICKS: Snapstream Personal Video Station 3, ATI MultiMedia Center 8.5, MusicMatch Jukebox 8.0, Listen Rhapsody, Easy CD Creator 6

Without the right software, your entertainment PC is nothing more than a normal computer. With the right software, your PC can rival the best consumer electronics that giants like Sony and Toshiba can build. We chose five separate applications to comprise the software mélange that will bring our entertainment PC to life:

Snapstream's *Personal Video Station 3* is the ultimate PVR software for your PC. It not only performs normal PVR duties like TV time-shifting and allows you to pause live TV, it also lets you stream live TV or any recorded content across a network—even the Internet—to any other PC with the right access. Pretty nifty, eh?

ATI's *MultiMedia Center 8.5* comes with the All-in-Wonder 9600 Pro. It includes basic time-shifting functionality for FM radio, but we're really just keeping it around for top-class DVD playback.

***MusicMatch Jukebox 8.0* is the premiere MP3 jukebox application. It plays, rips, organizes, and will even let you retag your music collection.**

We complemented *MusicMatch Jukebox* with Listen's *Rhapsody* program. *Rhapsody* is the PC equivalent of Apple's iTunes service. For $10 a month, you can stream whatever tunes you want from Listen's massive 300,000+ song library to your PC and burn individual tracks to an audio CD for $0.79 each.

Finally we include *Easy CD Creator 6* for our CD and DVD burning duties. *Easy CD Creator* finally caught up to *Nero* in speed and overtook *Nero* with a larger feature set and superior stability. It makes it easy to burn video DVDs from your recorded TV shows, audio CDs from your MP3s, and data CDs for whatever else you might need.

- **Snapstream PVS3, www.snapstream.com, $80**
- **ATI's MultiMedia Center 8.5, www.ati.com, free with All-in-Wonder 9600 Pro**
- **MusicMatch Jukebox 8.0, www.musicmatch.com, $15**
- **Listen Rhapsody, www.listen.com, $10/month, $0.79/burned song**
- **Easy CD Creator 6.0, www.roxio.com, $100**

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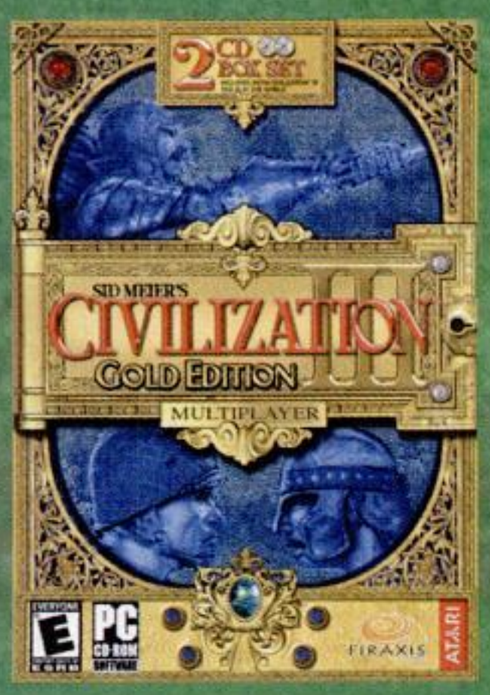

BUT FOR A FEW DECISIONS, THE WORLD COULD BE A VERY DIFFERENT PLACE. REMEMBER THAT. Put yourself in charge of the world. Will history repeat itself? Will things turn out better? Worse? This is your chance to find out by playing the computer game that over a million have played and loved, in a special bundled pack that immediately gives you the biggest and best gameplay experience possible. World history, rewritten from the keyboard of your PC. The only question now is, how will you rewrite history?

"The Greatest Computer Strategy Game of All Time"
– Time Magazine

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FIRAXIS

PC CD ROM

POWERED BY gamespy

EVERYONE
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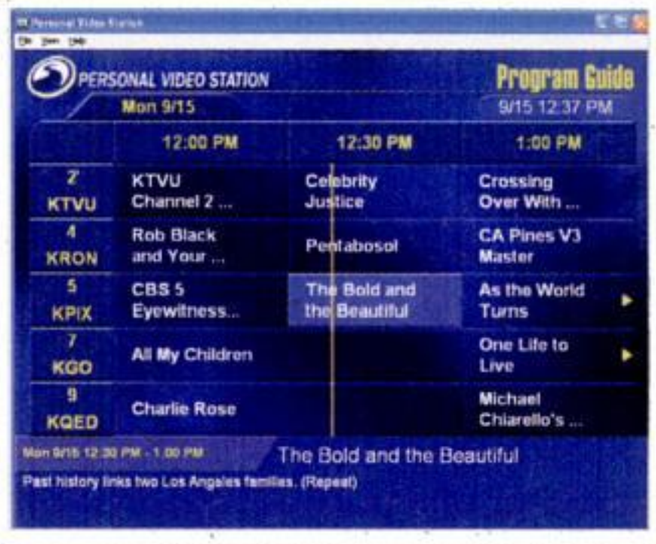
CONTENT RATED BY ESRB

Mild Violence

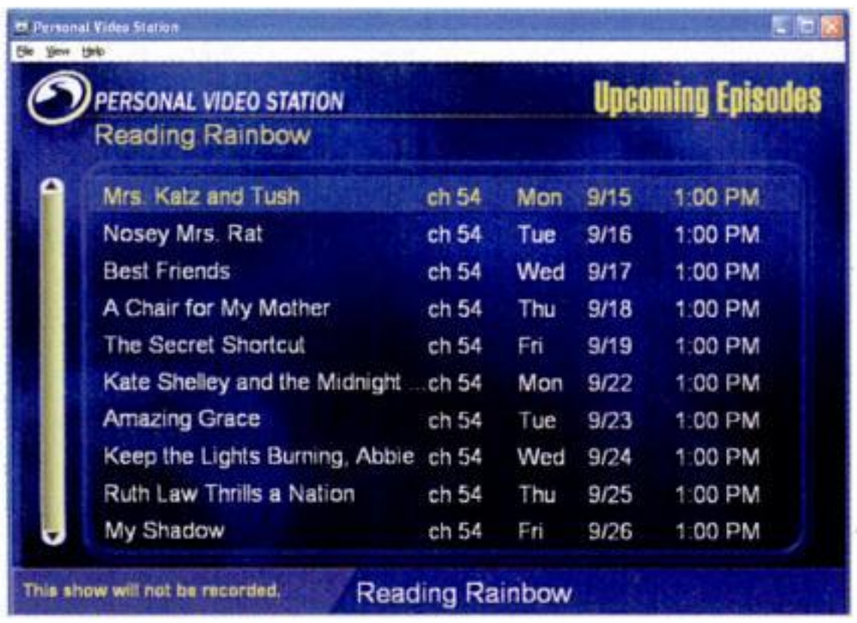
Getting To Know Snapstream Personal Video Station 3

We're firmly convinced that Snapstream's *Personal Video Station 3.2* is the best PVR software available for your PC. Here's why...



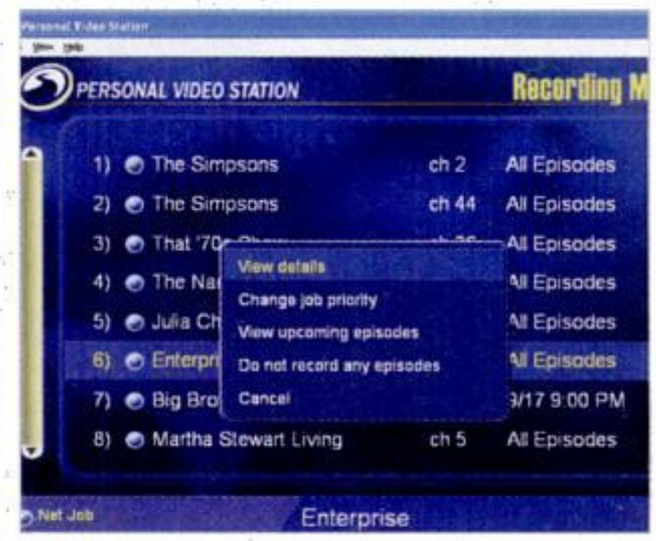
ADVANCED GUIDE LISTINGS ARE AVAILABLE ANYWHERE

All PVR applications for your PC will let you add, remove, and change scheduled programs from the PC on which the software is installed. But with *PVS3*, you can change your scheduling from *any* web-connected PC or WAP-enabled cell phone—perfect when you need to make a last-minute recording change while on the road. From the listings, you can choose whether you want to record just a specific episode, all the episodes of the same show, or just the new episodes of the show.



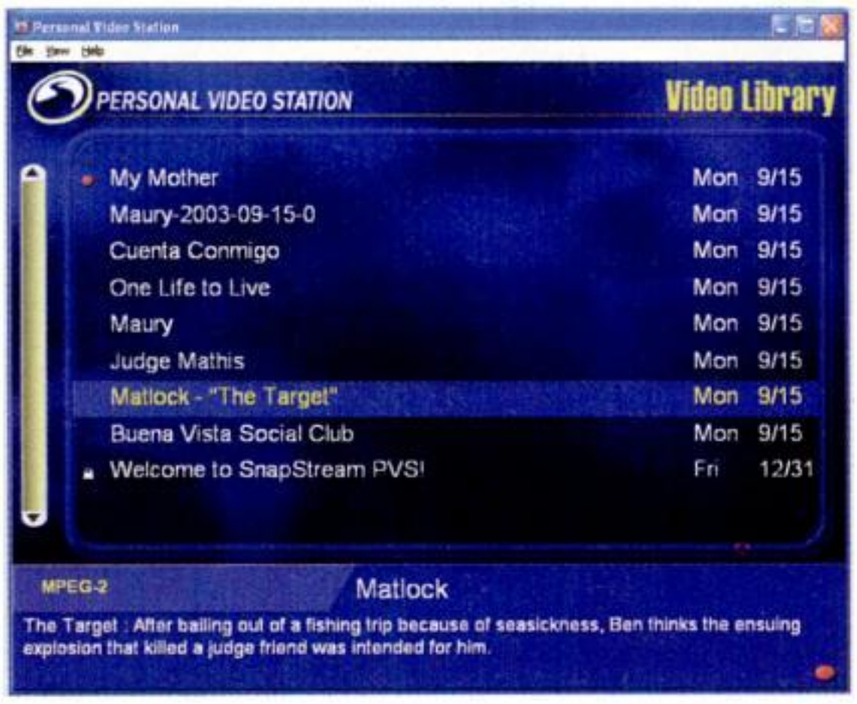
VIEW ALL UPCOMING EPISODES

Do you really like *Reading Rainbow*? We know you do. Using *PVS3*, you can list all the upcoming episodes of your favorite shows, then pick and choose the ones you want to record.



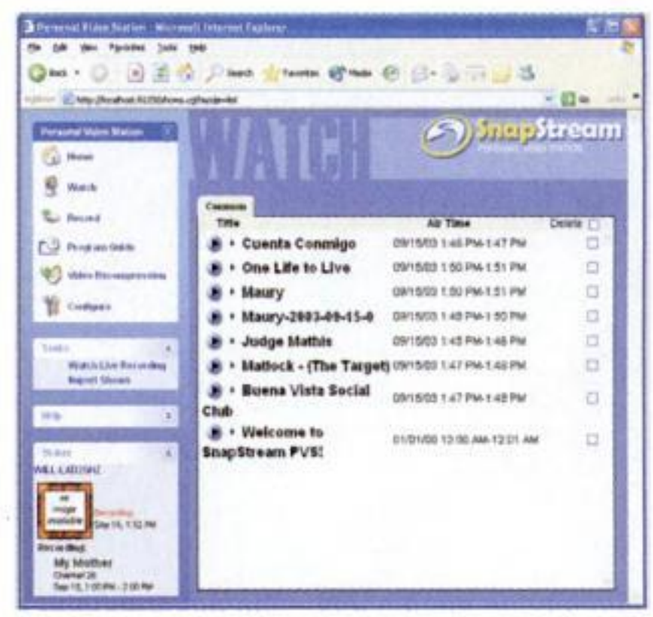
TRACK UPCOMING RECORDINGS

Using the Recording Manager, you can see what will be recorded next, and ensure that you don't accidentally record *Miss Match* instead of a baseball game. You can even bump up the priority of your favorite shows, so you won't miss anything you really want when scheduling conflicts occur.



WHAT'S ON TV?

Once *PVS3* has been running for a few weeks, you'll have dozens of recorded programs stacked up and ready to watch. From the Video Library menu, you can control when programs are automatically deleted. You can also manually delete them, or flag them to remain forever.



WATCH RECORDED SHOWS ANYWHERE ON THE WEB

If you've got a fast enough connection to the Internet, and have configured *PVS3* properly, you can stream recorded shows or liveTV to any PC with a fast-enough web connection. You can even stream TV to your PocketPC via a Wi-Fi connection!

TIMESHIFT WITH THE PROS

Just like TiVo and ReplayTV, you can rewind, pause, and fast-forward liveTV using any of the supported remotes.

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- 1.0GB DDR400 (PC3200) 4GB Max
- Dual 120GB **Western Digital** 7200 RPM Ultra ATA/100 Hard Drive
- **Pioneer** A06 DVD-R/RW
- **Lite-On** 52X24X52x CDRW Drive w/Nero Burning Software
- 256MB DDR SDRAM **nVidia GeForce** FX5900
- **Ultra AGP** 8X Video Card
- **Creative Labs** Sound Blaster Audigy2 Sound Card
- **USB Version 2.0 Onboard**
- **3Com** Gigabit Network card
- 56K **US Robotics** V.90 Data/Fax Modem
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Putting It All Together

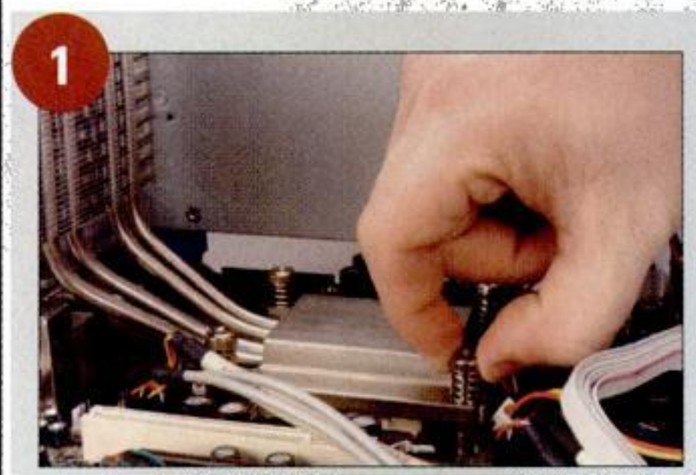
Our Shuttle box makes the hardware assembly phase of our project much easier: Because it already has a mobo and PSU installed, we don't have to build our entertainment PC *completely* from scratch. And in fact, on the next two pages, you won't see every single step of our assembly process, either. Instead, we're providing just a quick cheat-sheet. However, if you're a novice at PC building, and you want a complete guide, you can get it at **http://maximumpc.com/reprints/reprint_2002-03-13.html**, or send a request to input@maximumpc.com with the subject header "Build It PDF Request."

You'll be pleased to know that putting together a Shuttle bare-bones system is easier than building a full PC from scratch. All you need to do is install the CPU, memory, storage drives, AGP card, and OS.

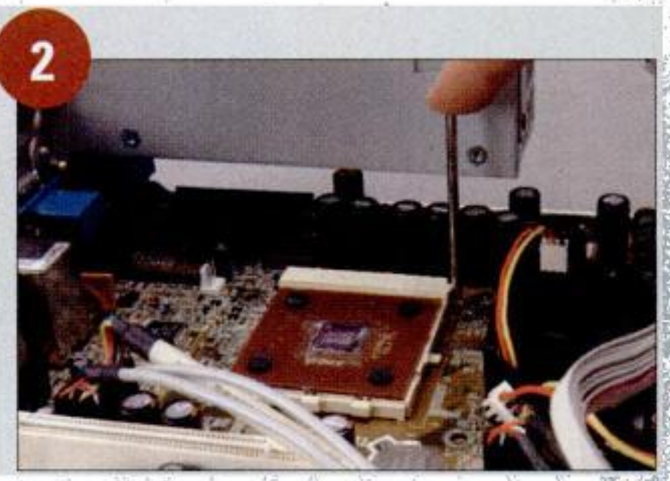
SOCKETING YOUR CPU

Before you get started, you need to open up the Shuttle. First, remove the screws that secure your Shuttle's lid, then lift the lid off the chassis. Now remove the drive cage—it's the big U-shaped metal thing near the optical bays at the front of the case. Next, you'll need to remove the CPU cooling assembly. To get it out, remove the thumbscrews holding the fan mount from the outside of the back of the case. Now lift the fan assembly off the radiator and remove the screws that hold the heat pipe to the CPU socket (figure 1).

Now that your CPU socket is exposed for all the world to see, you're ready to mate it with the CPU (we used an Athlon XP 3000+). Lift the CPU locking lever and gently drop the CPU into the socket, making sure not to force it in. If you've properly aligned the CPU, you shouldn't need to apply any force at all to seat the proc. Once the CPU's substrate is flush with the socket, push the locking lever back down until it clicks into place (figure 2). After the CPU is seated, apply a small amount of thermal grease to the core, then replace the CPU cooling mechanism. Make sure not to over-tighten the heatsink when you lock it down. You should tighten the screws by hand, and then give them a quarter twist with your screwdriver. Over-tightening can kill your Athlon.



Before you can mount the CPU, you need to remove the cooler and heat-pipe assembly from its mount.



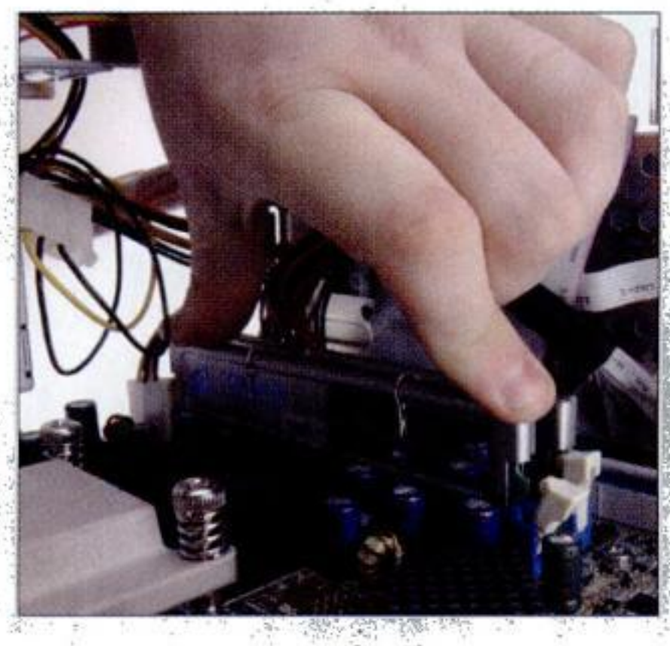
Once you've removed the Shuttle's heatsink assembly, you can drop your Athlon XP into the CPU slot.

INSTALLING THE MEMORY

Now it's time to install your DDR400 memory. Because the nForce2 is a dual-channel chipset, you should really install matched sets of memory in the Shuttle's two memory slots. By doing so, you'll be able to run the memory at a speed that's effectively twice as fast as the single-channel mode.

The memory slots are under the drive cage in this particular case, so you'll need to remove the cage before you can get started. Once the cage is out of your way, take each memory stick, align the notches on the slot with the grooves on the stick, and slide the stick in. Once the memory is lined up with the slot, push it down until it clicks into place. You may have to apply a lot of force to get the memory fully seated. It's an absolute pain in the ass to install the RAM after you've reinstalled the drive cage, so make sure you do things in order!

Installing memory is as simple as aligning the chips with the slots and pushing.



INSTALLING YOUR DRIVES

Now that your CPU and memory are installed, it's time to plug in your drives. Take a look at your Shuttle's drive cage. We recommend putting the hard drive in the bottom slot and the optical drive in the top slot, and forgoing a floppy drive—1.44MB just isn't enough space to fool with these days. There are specific holes lined up in the bottom slot of the drive rack for the hard drive, and you'll need to make sure the optical drive's front panel lines up properly with the front of your Shuttle case. You can

Both your hard drive and your DVD burner must be mounted in this drive cage before you put them in your PC.

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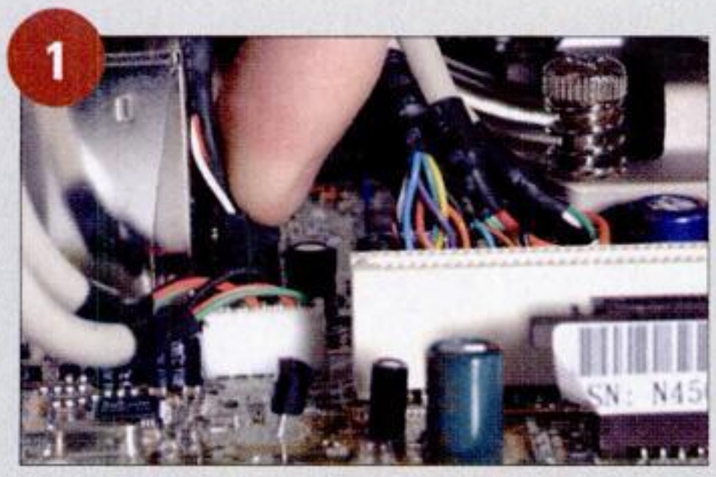
do this by lining up the bezel of the drive with the 3.5-inch slot cover that's mounted in the drive caddy.

Once you mount the drives in the drive cage, you'll need to slide the cage into the case. Before you do, make sure the jumpers for the drives are set properly. The hard drive should be set to be master and the optical drive should be set to slave. We recommend plugging the IDE and power cables into your hard drive before you set the cage in your case. They're difficult to access once you screw down the cage.

Slide the drive cage into the case bezel first, and then lower the back end until it's flush with the top of the case. Be very careful not to force it. You may need to adjust the IDE and power cables to get everything in. If you're using a videocard that requires extra power, such as the All-in-Wonder 9800 Pro, you'll also need to keep a floppy power connector available on the left side of the case to give the board the additional juice it needs. Once the cage is in the case, you can slide it all the way forward and lock it in place using the screws on the top.

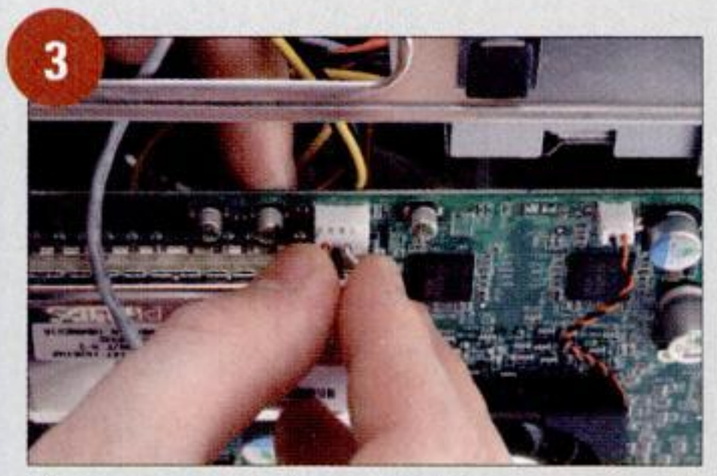
INSTALLING YOUR VIDEOCARD

All that's left on the hardware front is the All-in-Wonder 9600 Pro. Turn the case around until you have easy access to the left side, and remove the slot cover from the AGP slot's faceplate. Next, slide the 9600 into the slot and screw it into the mounting bracket (figure 2). Make sure you pick the proper output dongle for the videocard. If you're going to use a monitor or normal TV as your display, use the black dongle. HDTV users will need the red dongle. You also need to connect the audio output on the 9600 Pro to the audio header on the motherboard (Figure 1 and 3).



Before you install your videocard, make sure you connect the internal audio cable to the header on the mobo.

Installing a new videocard can be a bit tricky once the drive cage is in place, but the All-in-Wonder 9600 Pro is small enough to fit without a problem.



To get sound from the TV tuner to the SN45G's onboard sound, you need to use this old-fashioned internal audio cable.

CLOSING THE CASE

Everything's installed, so you should plug the keyboard, monitor, and power cord into the PC and power it up to make sure it passes the power on self test (POST). If the PC POSTs properly and all your drives are detected by the BIOS, you can pull the power and put the cover back on the Shuttle box. Make sure you don't catch any wires when you're closing the cover, and pay close attention so the sides get into their guide grooves. When you reconnect your display, the power, and your keyboard, mouse, and remote, you can power up the system and make sure that everything is configured properly. For most people, that's as simple as setting everything to automatic.

Once you've tested your machine to make sure it boots, you can close the case and install Windows.

INSTALLING YOUR SOFTWARE

Once the hardware's working properly, you can install Windows. Installing WinXP can be as easy as popping the CD into your optical drive and following the prompts. However, there are a few tricks to follow when you're using a drive larger than 133GB.

With large hard drives, nothing beyond the 133GB mark will show up in the Windows installer's partitioning tool. To fix this, we recommend that you create a small 40GB partition using the XP installer, install the OS on that partition, install the chipset drivers for your motherboard (which will make the rest of your drive available), and then create a large partition that fills the rest of the drive.

Why such a small partition? Because we plan on using the small partition only for the OS, the important applications, and digital music. Even a massive music collection probably won't exceed 20 or 30GB, leaving plenty of room for Windows XP and your applications on the C: partition. Just don't partition or format the rest of the drive until Windows and the chipset drivers are installed.

Once Windows is installed and activated, you need to install drivers for your hardware, as well as for any service packs and critical updates on the WindowsUpdate.com site. Then you can go into the Computer Management tool by going to Start, then Run, and typing `compmgmt.msc`. From there, go to the Storage section and look under Disk Management. Right-click the unformatted section of the drive, select "Create partition," and make a primary partition. Then you'll need to format your new partition by right-clicking it and choosing Format.

Now you can install some apps, make some popcorn, and fire up a DVD. Your entertainment PC is complete! ■

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Halo Invades

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Blood and Gore

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gearbox software

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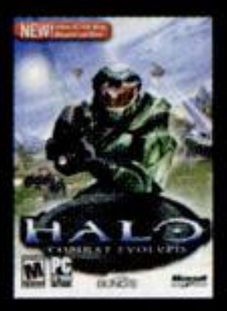
www.microsoft.com/Games/Halo



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Windows Services Exposed and Expunged

By Mike Williams

How do you simultaneously take control of your PC, free up system resources, and improve your security? The answer lies in Windows services—background programs under the hood of Windows XP, some of which are just begging for elimination.

Do you remember Windows 3.1? It was revolutionary for its day, but in retrospect, the OS was extremely simple. Once you'd mastered File Manager and Program Manager, there was little else to learn. Step forward 11 years to Windows XP and the situation is very different. The operating system is now packed with features, far more than most people will ever use. Do you want to expand your Clipboard so it can share information with other users on a local network, for example? Or index the contents of files on your PC to speed up local searching? Or allow remote users to log in to your system from over the Internet? Or manage an uninterruptible power supply attached to your PC?

Some of these ideas may seem unappealing or irrelevant, but that's just tough—Windows XP (along with, to a lesser extent, Windows NT and 2000) comes with them built in. And many are enabled by default, whether you want them or not.

This sounds like a bad situation, but the reality is a little different. These integrated features are implemented as "services," programs that run in the background on your PC, and Windows XP gives you all the tools you need to control them. So if you would like a faster, leaner, more secure PC, then learning the basics about services is a great way to start.

Gaining Control

To find out what's happening on your PC, launch the services console (Control Panel > Administrative Tools > Services, or just select Start > Run and enter `services.msc`). The console displays a list of all the services registered on your PC. Unusually for Windows, most services are accompanied by a lot of detail about what they do; make sure you click the "Extended" tab to view it all.

As you're scrolling down the list, pay particular attention to any services that have "Started" in the Status column. These are currently running, and consuming at least some of your PC's resources. You could find 30 or more enabled—alarming, isn't it? Particularly because many will be unnecessary for the kind of things you do with your PC.

Take a look at the "Startup Type" for each service, too. "Automatic" means the service starts on its own when required (or when Windows boots), while "Manual" services must be started manually (no surprise there). As you've probably guessed, services that are "Disabled" will not start under any circumstances.

The final column, "Log on as," illustrates a new security feature in Windows XP. Services that log on as "Local System" have full user privileges on your PC, which essentially means

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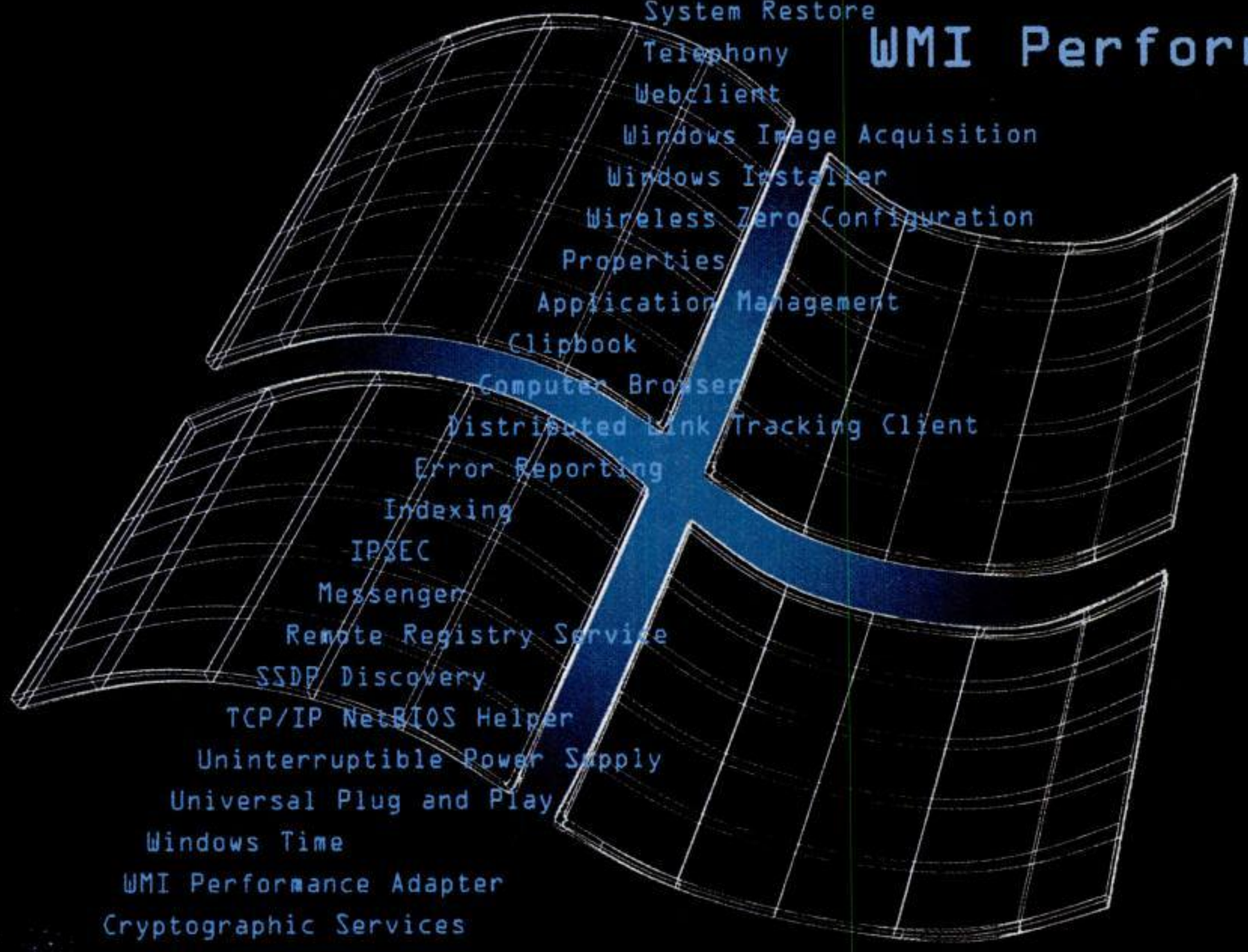

Universal Plug an

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Windows Services Exposed and Expunged

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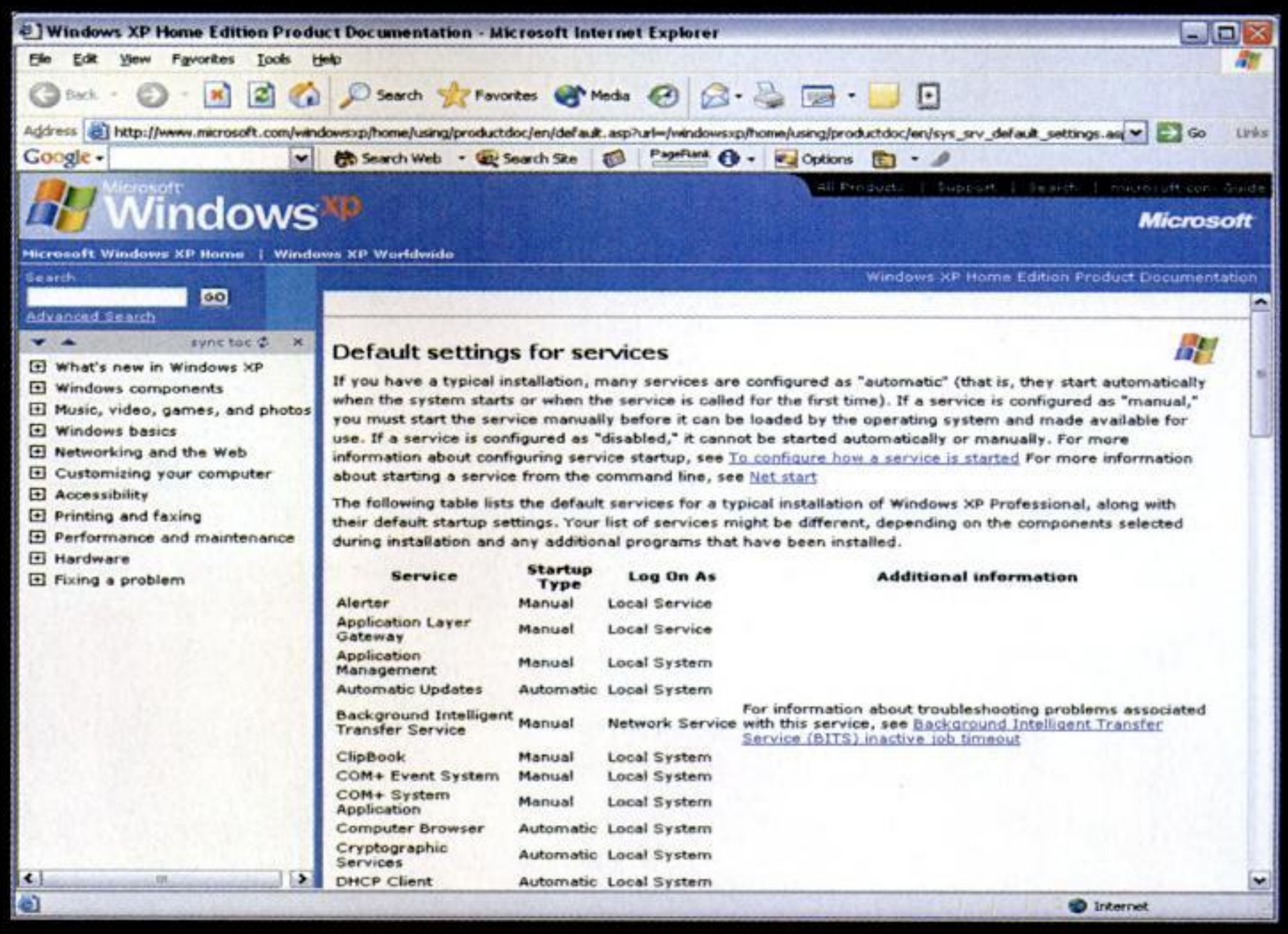
they can do whatever they like. However, services that log on as "Local Service" or "Network Service" have only the minimum privileges they need to carry out their tasks. So, even if a hacker manages to compromise one of these, the hacker will be limited in what he can do.

Don't start changing all your services to log on as "Local Service" or "Network Service." Many need the "Local System" account privileges, and changing their status could result in some strange behavior.

You've probably already spotted some services that look entirely unnecessary. Turning them off could save a little memory, reduce the time it takes your system to boot and close down, and even make your PC more secure. But make the wrong choice, and you could introduce a variety of odd and apparently unrelated problems. So which services are safe to remove, and what's the best way to do it?

Essential Services

Perhaps the best place to start is by detailing the services you really should keep running, regardless of how your system is configured. We think these all qualify as essential services, so their settings should be left as "Automatic."



Microsoft lists the default Windows XP Home service settings at www.microsoft.com/windowsxp/home/using/productdoc/en/sys_srv_default_settings.asp.

➤ Anti-virus Software

You'll probably find that your antivirus program (perhaps your firewall, too) is running as a service. If you want to turn it off, though, it's best to do so via the "official" route (perhaps right-click an icon in your system tray).

➤ Cryptographic Services

Even if you don't need the Certificate services provided by this program, its other functions (like checking to see whether new drivers are digitally signed) are useful. We say, leave it be.

➤ Event Log

This excellent feature records problems reported by other programs and services, which you can then view later (Control Panel > Administrative Tools > Event Viewer). Very useful, and we strongly recommend that you leave it running.

➤ Plug and Play

You need this for your PC to recognize new devices as they are installed, or if you plug something into a USB or FireWire port, or even if your system has to redetect your hardware for some reason.

➤ Remote Procedure Call

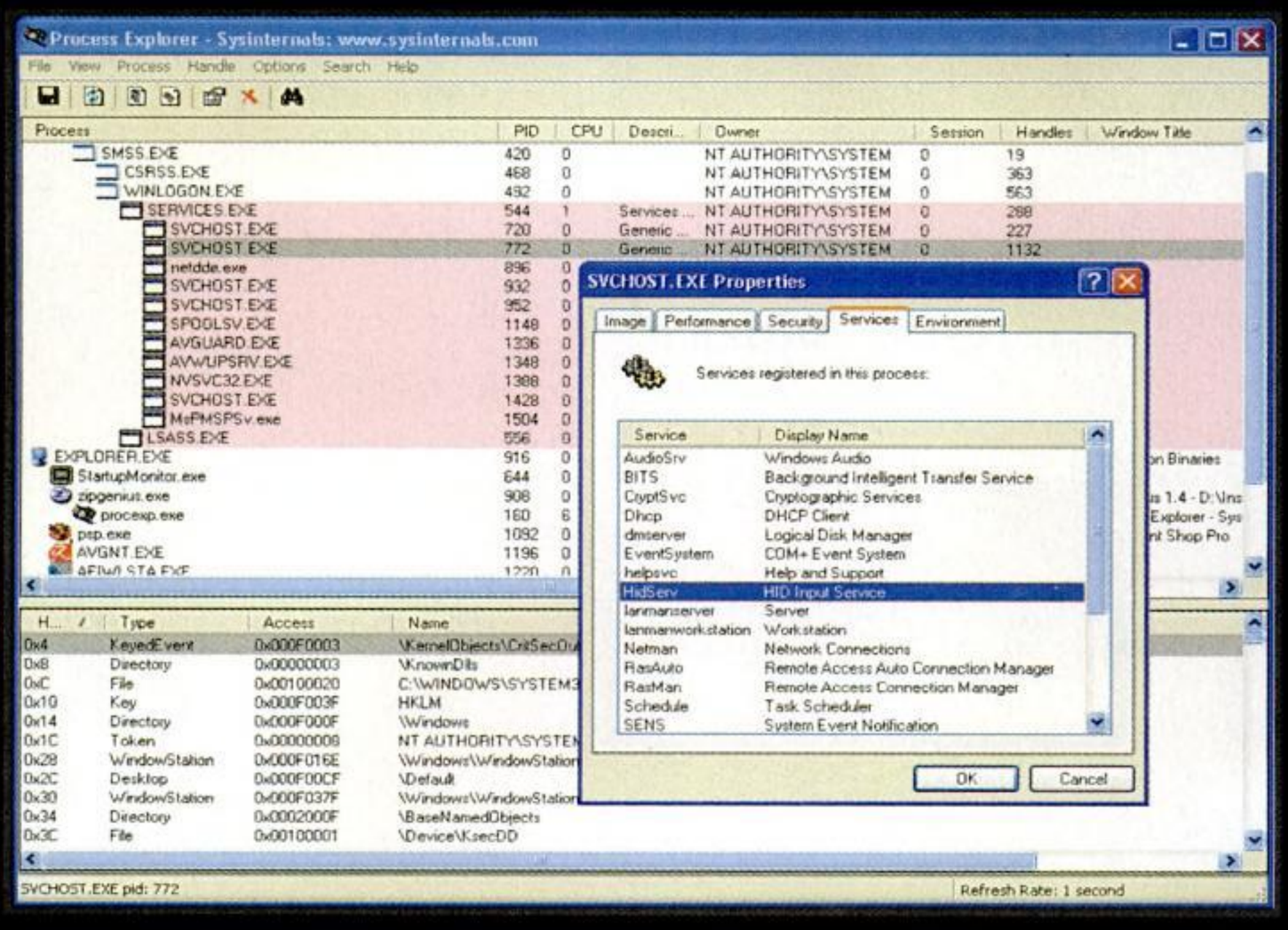
Windows applications generally run in separate processes, which is a good thing (a crash in one application doesn't affect others, for example). Communication between processes can be handy, though, and that's the feature that RPC provides. Windows needs RPC to run, and disabling this feature is likely to cause very serious problems. So don't do it.

➤ Task Scheduler

You may never use this service to schedule night-time defrag operations, but it does have other handy applications, like the File Optimizations provided by the Windows XP Prefetcher (see the "Prefetch" section at **msdn.microsoft.com/msdnmag/issues/01/12/XPKernel/default.aspx**). Leave it set to "Automatic."

➤ Windows Audio

If you want to hear sound from your PC, allow the Windows Audio Service to stay running. And if you don't, just turn the volume down. This service should only be disabled if you don't have a



For the best overview of the services running on your PC, run the SysInternals Process Explorer (www.sysinternals.com/ntw2k/freeware/procexp.shtml).

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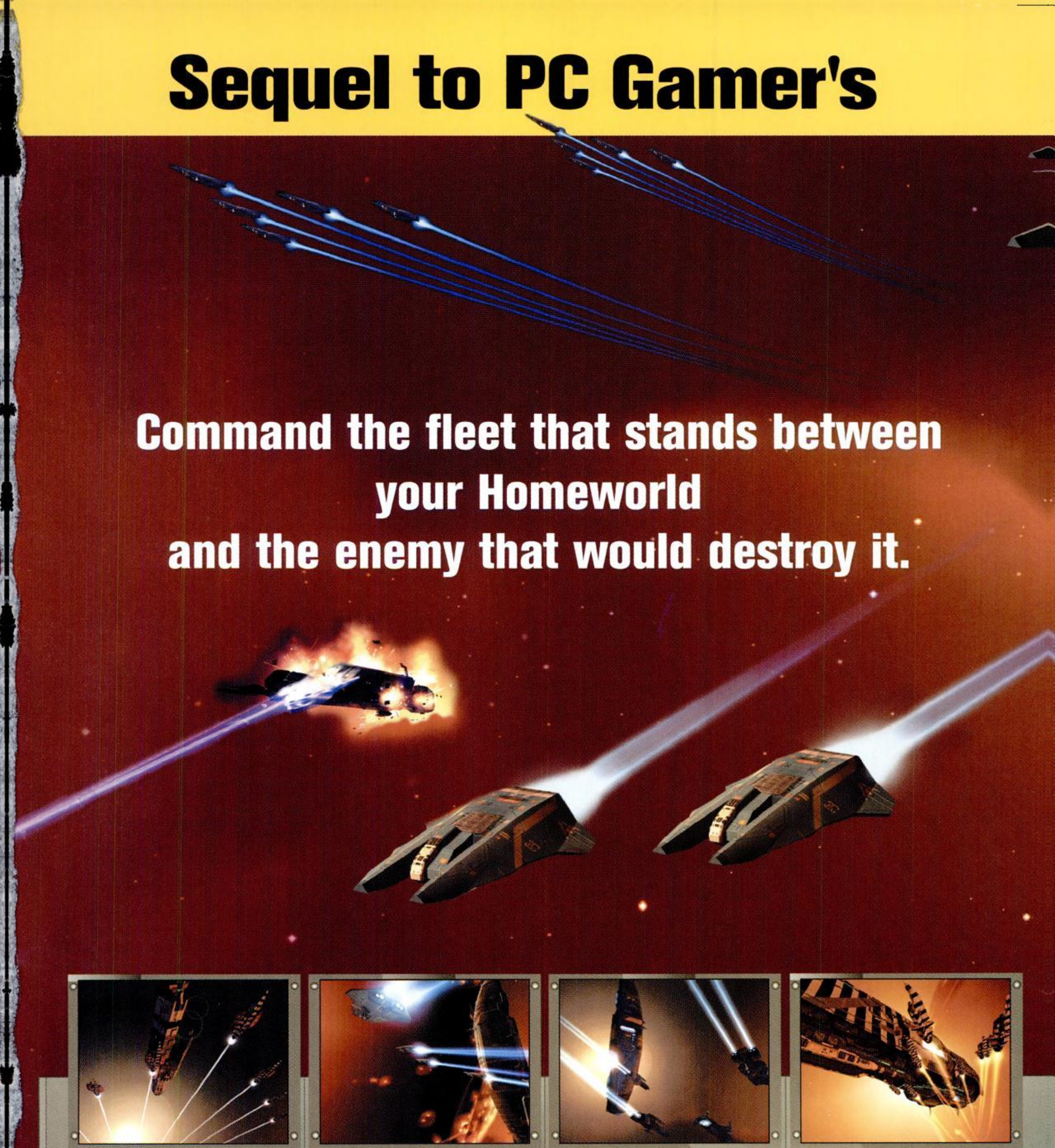
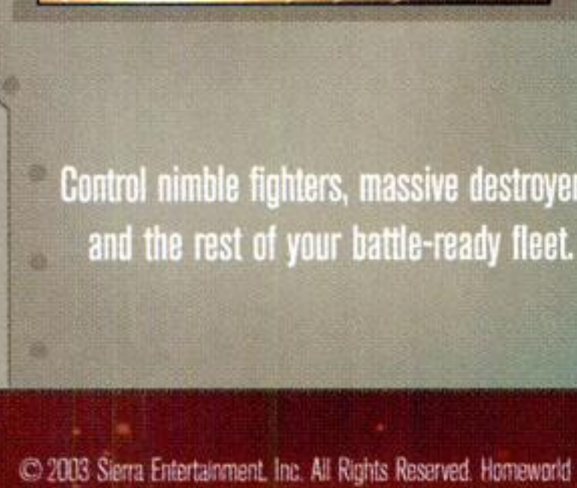
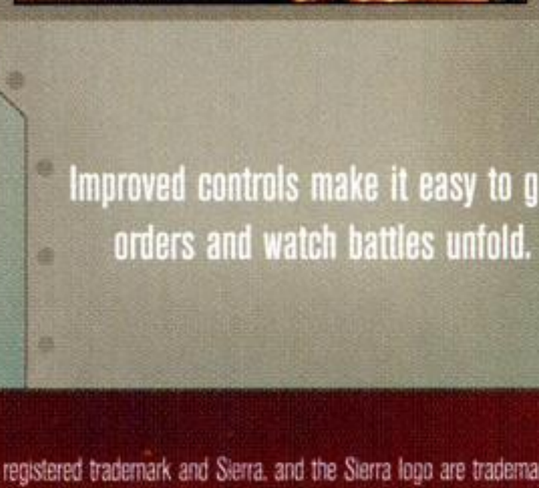
Sequel to PC Gamer's

Command the fleet that stands between your Homeworld and the enemy that would destroy it.

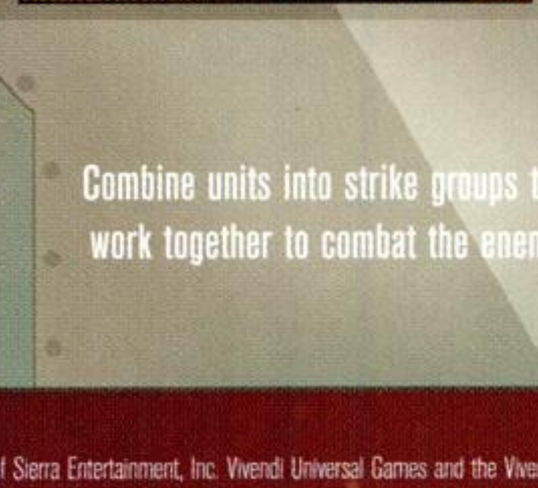




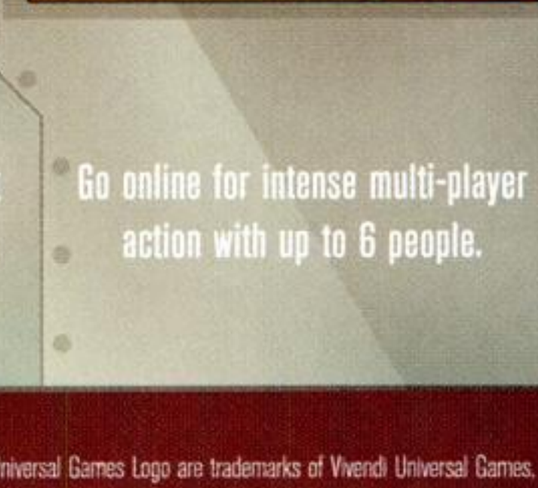
Control nimble fighters, massive destroyers, and the rest of your battle-ready fleet.



Improved controls make it easy to give orders and watch battles unfold.



Combine units into strike groups that work together to combat the enemy.



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soundcard or integrated sound on your motherboard.

➤ **Windows Management Instrumentation**

This service provides an interface that software can use to access and control various Windows functions (see "Programming Services"). Windows itself uses WMI, as do many other applications, so it's best to leave it set to "Automatic."

➤ **Workstation**

Allows access to remote files and other resources across a network, as well as provides support for some Internet services like "Background Intelligent Transfer." To be safe, whether you're networked or not, you really should leave this running.

Useful Services

One of the problems with the default Windows services settings is that they are configured in an unintelligent way. For example, some services may be vital for a networked system and useless for anything else, but Windows will still launch them on a stand-alone PC. These are some of the services you may be able to do without, depending on your circumstances.

➤ **Application Layer Gateway**

Essential whether you're using Windows Internet Connection Sharing or the Internet Connection Firewall. Useless if you're not. (The same applies to "Internet Connection Firewall [ICF]/ Internet Connection Sharing [ICS]" and "Network Location Awareness.")

➤ **Automatic Updates**

If you prefer to not have Windows XP check for updates on its own, then this service can safely be disabled. If you do disable it, however, don't forget to routinely check **www.windowsupdate.com** for updates.

➤ **Background Intelligent Transfer**

Used to download Windows updates in the background, so if you've disabled "Automatic Updates," this can be turned off as well.

➤ **COM+**

Both the Event System and System Application Services help to administer Microsoft's Component Object Model system (see **www.microsoft.com/com/tech/COMPlus.asp** if you're interested). You may be running an application that needs it (even if you have a stand-alone PC), so leave it set to "Manual," if you know what's good for you.

➤ **DHCP Client**

Obtains an IP address from a DHCP server, either on a local network or (possibly) for your Internet connection. If you don't use DHCP you can try disabling it, but put it back if you start having problems.

➤ **Help and Support**

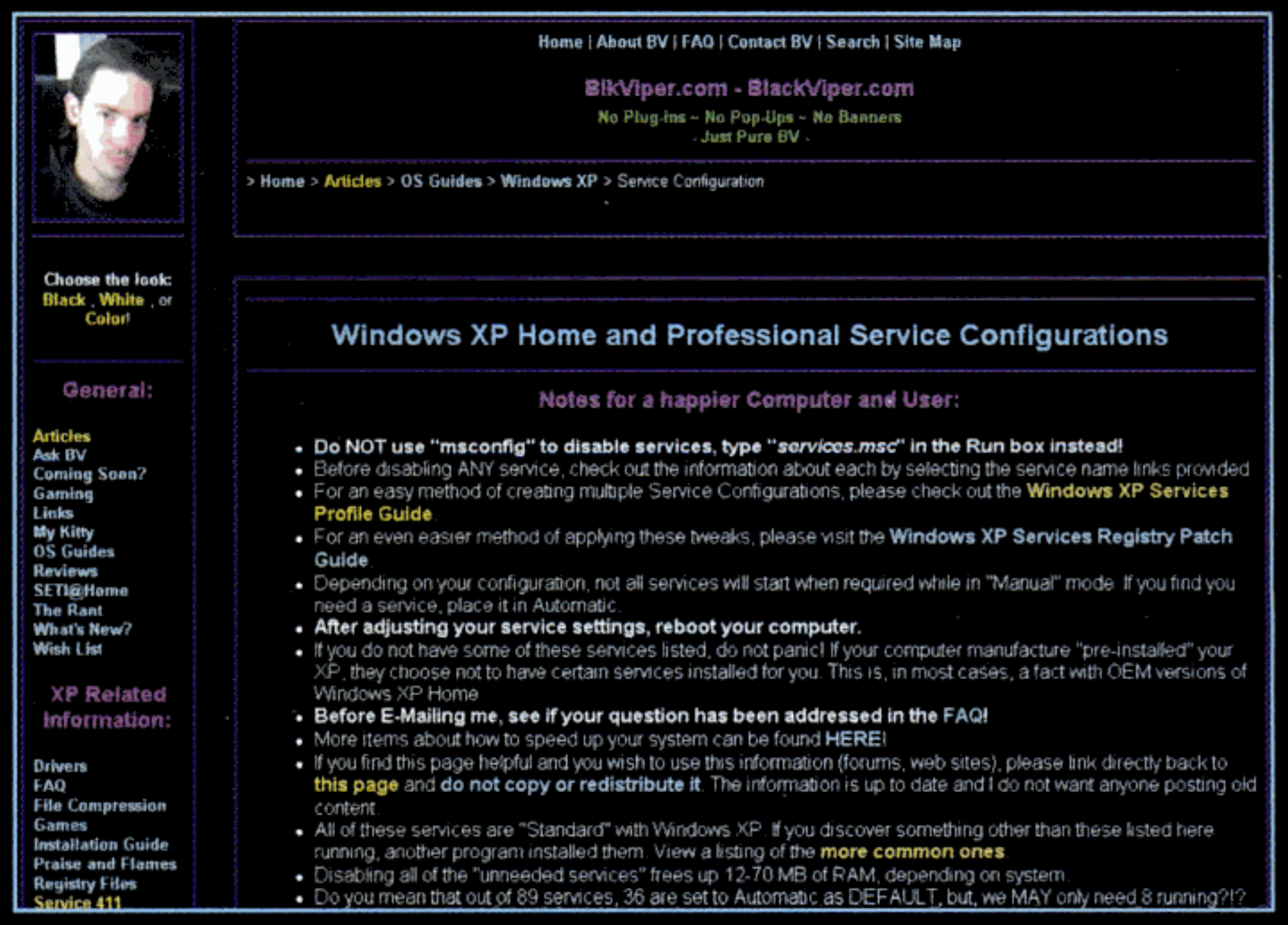
Why is Windows Help a service? We have no idea. You can disable this if you like, but be aware that selecting Start, Help, or Support will restart it again.

➤ **HID Input Service**

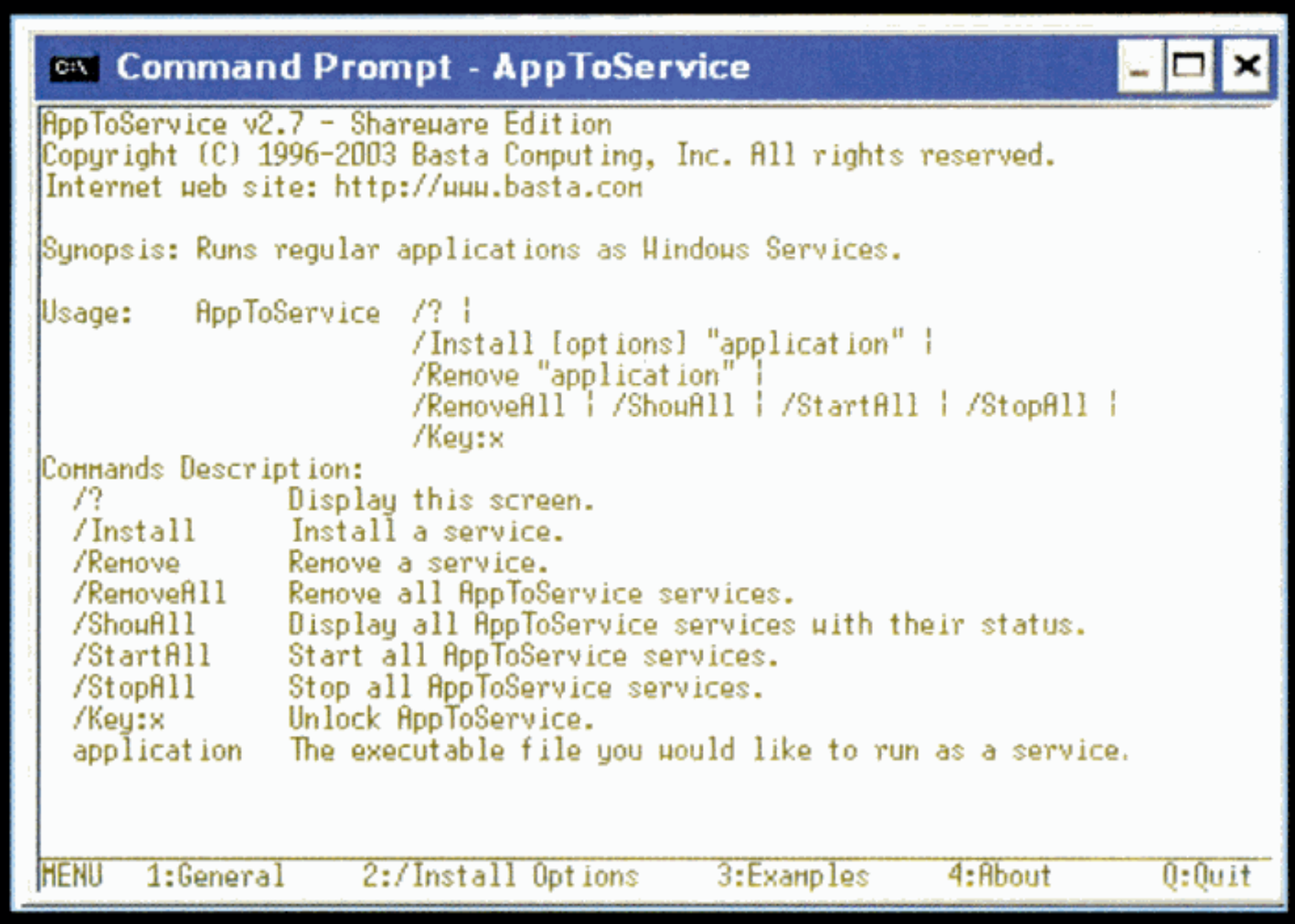
Provides support for "hot buttons" on various input devices. Try turning this off; and restore it if you can't, for example, control *Windows Media Player* using the special buttons (Back, Next, Play, Stop, Volume) on your keyboard.

➤ **Logical Disk Manager**

If you want to manage your hard drives (right-click My Computer, select Manage, and then Disk Management), this needs to be running, along with the Logical Disk Manager Administrative service. As you might want to do this occasionally, we'd suggest leaving both services set at "Manual."



You'll find more thoughts and ideas about how to configure your Windows Services on Black Viper's voluminous web site: www.blackviper.com.



Ever wanted to run an application of your own as a service? *AppToService* (www.basta.com/ProdAppToService.htm) is shareware that shows you how (and why).

Improving on Task Manager

Task Manager is great for listing programs, but useless for services—there is a better way

Have you ever used a firewall to control outgoing Internet connections on Windows XP? If so, you'll have come across warnings telling you that "SVCHOST.EXE" wants to contact the outside world. But what does this actually mean?

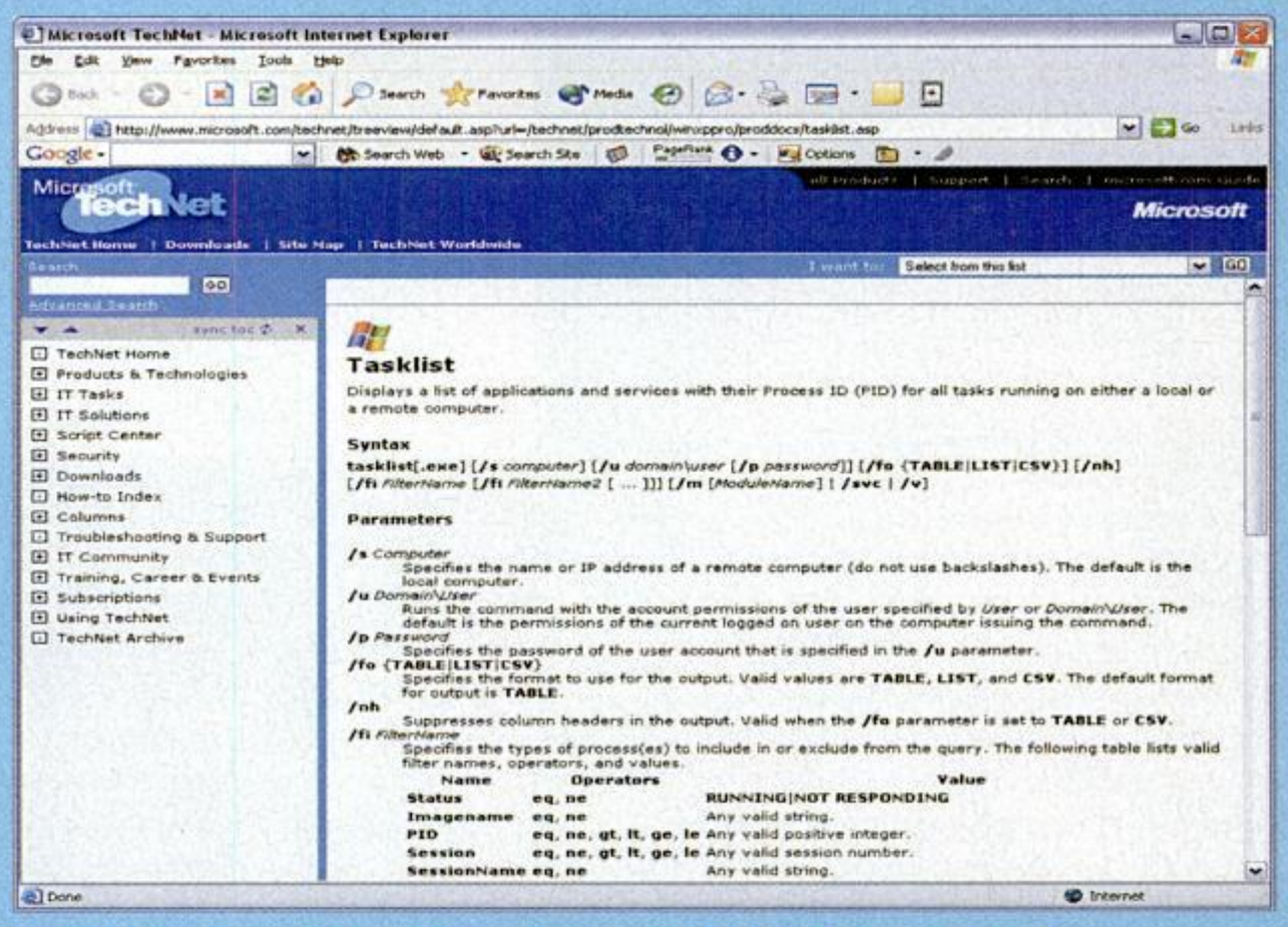
As firewall warnings go, it's really rather vague. SVCHOST.EXE is a shell program that's used to provide the functionality for many built-in Windows services, so figuring out which one wants to go online is tricky. To make things worse, you'll probably have multiple copies of SVCHOST.EXE running at any one time (press Ctrl+Alt+Del and check Task Manager to make sure).

Open a DOS command window, and enter the line `TASKLIST /SVC` for Windows XP Professional, or `TLIST -s` for Windows 2000 (use `TASKLIST /SVC | MORE` if the output scrolls off the screen). You'll see a list of every task running on your PC, along with its Process ID (PID), and any associated services it's running. (Or "N/A" if the task isn't responsible for any services.)

It's interesting to see which of your tasks is actually responsible for a service, but a quick look at Task Manager will reveal a problem. How can you relate the SVCHOST.EXE files listed by the TASKLIST command to the copies displayed in the Task Manager?

The answer is to ensure Task Manager displays the Process ID of each task, so you can match them up. This isn't the default setting, so you'll need to choose View > Select Columns, check the "PID" box and click OK.

If you think this sounds fiddly or complex, you're right. A better solution is to download the Process Explorer from SysInternals **(www.sysinternals.com/ntw2k/freeware/procexp.shtml)**. Just select Options > Highlight Services to see what you're running; right-clicking a service and selecting "Properties" gives you all the information you need on the resources it's using.



Read more about the XP Professional Tasklist command at www.microsoft.com/technet/prodtechnol/winxppro/proddocs/tasklist.asp.

➤ MS Software Shadow Copy Provider/Volume Shadow Copy

Manages the copies of files (or complete volumes) provided by the Volume Shadow Copy service. Unless you use Microsoft Backup, or another imaging program that requires these services, they can both be turned off. Again, you can flip the switch back on if your backup program doesn't work correctly afterwards.

➤ System Restore

It's nice to be able to "wind back" your system to undo the damage caused by installing a naughty driver, for example. Ideally, leave this service running. If you do decide to turn it off (Control Panel > System > System Restore), note that all your previous Restore Points will be lost as a result.

➤ Telephony

You definitely need this service if you use a conventional dial-up modem connection to the Internet. If you have a cable or ADSL connection, try setting this to "Manual" (it may still be required).

➤ Webclient

This allows you to browse to "Network Places" that are actually on the Internet, and lets Windows programs "create, access, and modify Internet-based files." As it reportedly can also slow down browsing on your local network, we recommend disabling it, then monitoring what happens next.

➤ Windows Image Acquisition

If you don't have a scanner or webcam, then you can turn this off. And if you do, it may not require the WIA service, so turn it off anyway (or just set it to "Manual" and see what happens).

➤ Windows Installer

This tool handles any programs that install using .MSI files. You're likely to need it occasionally, though not often, so it seems a good candidate for the "Manual" setting (where the service will consume RAM only when it's required).

➤ Wireless Zero Configuration Properties

Handy if you've got any 802.11x wireless adapters installed (it helps set them up), but entirely useless if you haven't (and yet, bizarrely, it may still be running anyway.)

Nonessential Services

We've been fairly cautious so far, and with good reason—some services really are important in keeping your system running smoothly. This category is different, though, and the chance of your needing one of these services is very slim indeed.

➤ Application Management

This provides "Assign, Publish, and Remove software services," so turning it off might cause problems installing or removing some applications (particularly Microsoft's). However, as this service doesn't even exist on Windows XP Home edition, we're not sure how widespread these issues might be. Try turning it off, and restore the service to "Manual" if you have any problems.

➤ Clipbook

This feature lets you view the contents of the Clipboard, store them permanently, and share them with other users on your local network (use Start, Run, `clipbrd.exe` to see how this works). It can be disabled if you don't feel you'll use it.

➤ Computer Browser

Keeps track of the other systems currently connected to your network, so it can be safely turned off on a stand-alone system. Even if you're on a networked system, you only need a maximum

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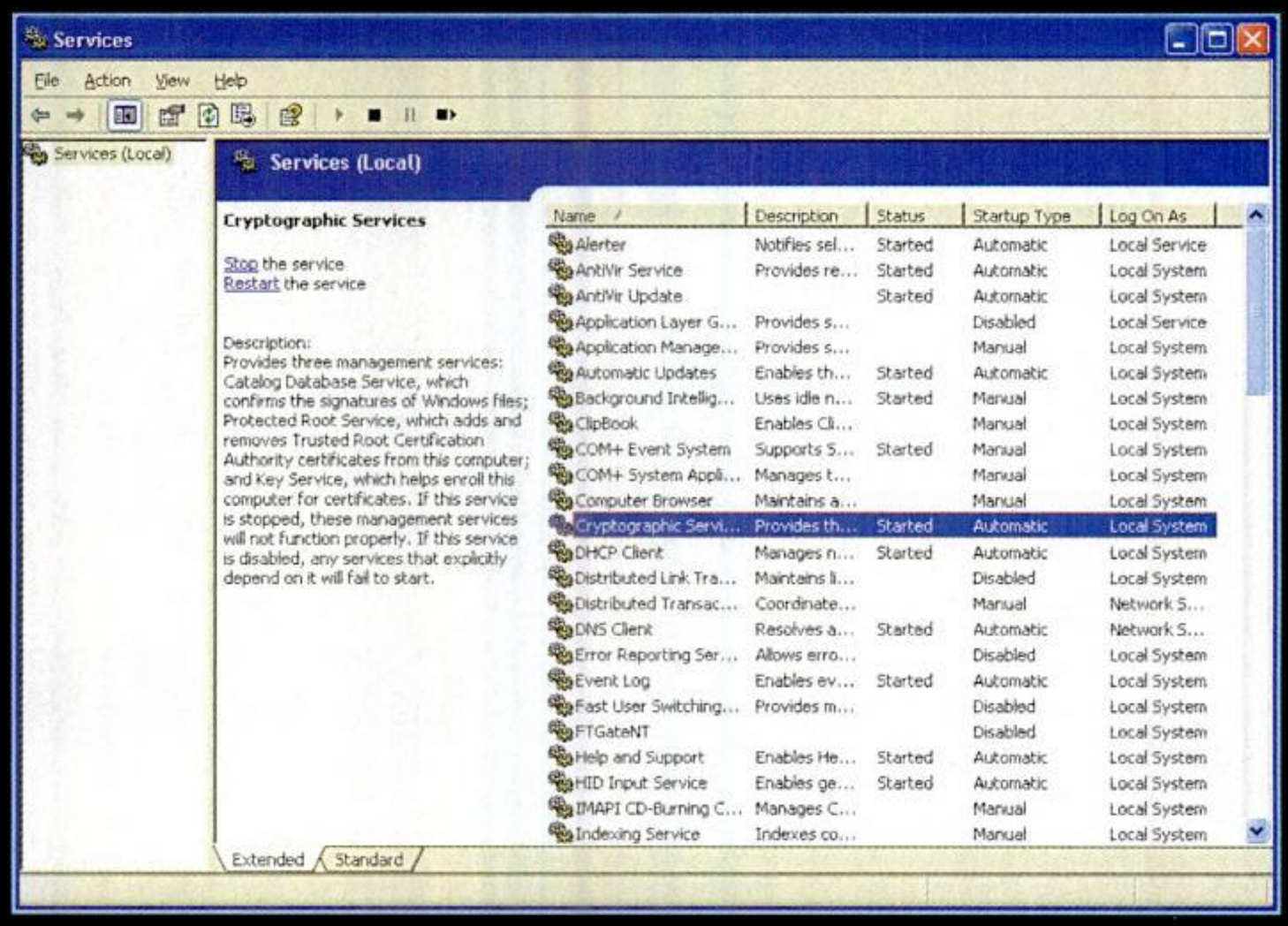
of two PCs running this service, and perhaps none at all if they're all Windows 2000 or XP-based systems (see **support.microsoft.com/default.aspx?scid=kb;en-us;Q188001**).

➤ Distributed Link Tracking Client

This service lets you create a shortcut to a file on a remote PC, then updates it automatically if the file is moved later. If you're on a stand-alone PC, or your networked systems don't use NTFS, or you just don't need this feature, then turn it off.

➤ Error Reporting

Ever wonder what's responsible for those dialogs that pop up when an application crashes, asking if you want to send a report back to Microsoft? Well, this service is the culprit. It's high on the "nonessential" list. Whether you want to be a part of the Windows XP and application bug hunt is up to you.



Unusually for Windows, most services provide a lengthy description of what they do (just make sure you click the "Extended" tab to see it).

➤ Indexing

A good idea in theory, this service creates a document index to speed up searches in Windows and Office XP (among other apps). However, in reality it consumes more resources than it's worth, and you're better off disabling it. (Restore it later if searches start to seem too slow.)

➤ IPSEC

If you're a telecommuter and need to

Security Services

If you want to stay secure, it's essential to keep an eye on your Windows services

Tweaking your service settings can help save a little memory, free up a few processor cycles, and reduce the time it takes your PC to boot (and shut down). However, if you have a fast new PC with lots of RAM, then you may feel your system runs sufficiently well already. Why spend time changing settings if the chances are you'll never even notice any difference?

The answer is, simply, to keep your PC secure.

There are two aspects to this. The first is straightforward: The more services you have running on your PC, the greater the chance that a hacker can find something to exploit. Some of this is common sense. Services like a web, FTP, or mail server are designed to allow some level of external access to your system. Unless you really need to provide these features, it's obviously wise to turn them off.

In reality, though, the same rule applies to many other services you may not suspect. Who could have guessed that "Universal Plug and Play," a service designed to help detect printers and scanners on your local network, would contain a critical security bug? Potentially it allowed an attacker to run the code of their choice on your PC (see **www.microsoft.com/technet/security/bulletin/MS01-059.asp**). This is bad news, especially as virtually no one actually needs to run this service anyway. So turn off anything you don't need, and you'll stand more chance of avoiding the next security scare.

For more on security and services (including how to delete a service, not just disable it), see the Security Focus article at online.securityfocus.com/infocus/1581.

The second issue is that many Trojans install themselves as a Windows service, so keeping track of what's running on your PC can help you identify these threats. If you find something that looks suspect, use REGEDIT to identify the files behind the service. Begin by locating the service under HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services, where you'll find one file name in the "ImagePath" value. If there's a "Parameters" folder, expand that too; it sometimes contains a "ServiceDll" value that will point you to another component of the service.

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Building Service Profiles

Would you like to quickly, easily turn whole groups of services on or off to suit your needs?

You're about to play a resource-hogging game on your PC, and all the network-related services have been left running. So wouldn't it be better if you could turn them all off, play the game, then restore normal service when you're done?

To see one way of achieving this, open a DOS window, and enter `NET HELP SERVICES | MORE`. As you'll see, the NET command can be used to start (and stop) a variety of services.

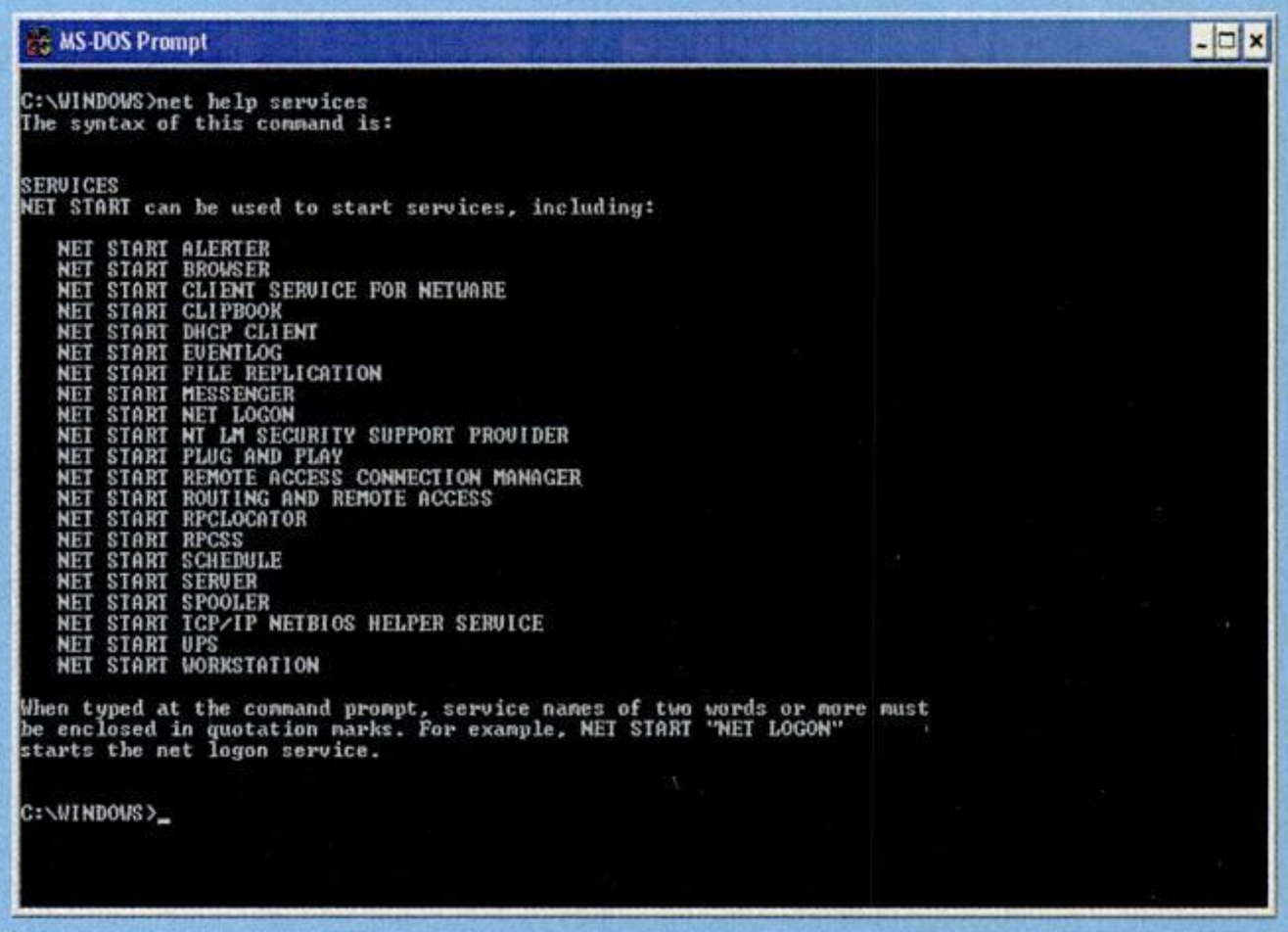
Now open up Notepad and create a file called STOPSERV.BAT that contains the lines `NET STOP CLIPBOOK` and `NET STOP MESSENGER`. Then create a second file called STARTSERV.BAT, containing the lines `NET START CLIPBOOK` and `NET START MESSENGER`. Place the files on your Desktop and you'll now be able to stop and start these with a double-click.

This works well, as long as you remember that some services rely on others. The Messenger Service depends on Workstation; when you're creating the restart batch file, that means a `NET START WORKSTATION` command must appear before NET START MESSENGER will work. Double-click on a service in the Services console, then select Dependencies for more information.

An alternative is to build one or more custom hardware profiles. To get started in Window XP, select Control Panel > System > Hardware > Hardware Profiles, choose your current profile, click "Copy" and give it a name along the lines of "Minimum Services."

Next, choose Start > Run, and enter `services.msc` to start the console. Select a service that's running, but that you don't need. Double-click it, select the "Log On" tab, and ensure it's disabled for the "Minimum Services" profile. Repeat this for every service you can do without.

Now, when you want to give a game or application everything you've got, just reboot your PC and choose your "Minimum Services" profile from the Boot menu, And best of all, if something goes wrong, it's very easy to recover—just reboot again, and choose the regular hardware profile.



Yes, the humble batch file is one of the best ways to speedily reconfigure your services. Who said the command line was dead?

connect to a remote network via a VPN, then Internet Protocol Security (IPSEC) may be useful. Otherwise it almost certainly is not—turn it off, and reclaim the resources.

➤ **Messenger**

No, not Windows or MSN Messenger. This is a service that sends messages between clients and servers across your network. It's obviously a superfluous feature for stand-alone systems, but home networks probably won't need it either. Turn the service off and see what happens.

➤ **Remote Registry Service**

Do you want remote users to be able to modify Registry settings on your PC? It's not as insecure as it sounds, but we'd still disable this feature unless you have a good reason to do otherwise.

➤ **SSDP Discovery**

A component of "Universal Plug and Play"—whether you disable that or leave it running, you need to do the same with SSDP Discovery.

➤ **TCP/IP NetBIOS Helper**

Generally required only if your local network uses NetBIOS over TCP/IP. Turn it off, restoring the service if you have any subsequent network (or possibly Internet) problems.

➤ **Telnet**

Allows remote users to log on to your PC and run programs. Turn it off, unless you really need this service for some reason.

➤ Uninterruptible Power Supply

It's safe to disable this, unless of course you really do have a UPS.

➤ **Universal Plug and Play**

Discovers devices attached to remote PCs on your network. May also be necessary if you use Internet Connection Sharing and allow others to modify the connection properties. Its security issues have now been resolved (**www.microsoft.com/technet/security/bulletin/MS01-059.asp**), but unless you need this service, it's still wise to turn it off.

➤ **Windows Time**

Synchronizing your clock via an Internet time server is a good idea, especially if you have an "always on" Internet connection. But doing so via a Windows service that's running all the time is not the most efficient route.

➤ **WMI Performance Adapter**

Windows Management Instrumentation (WMI) is an essential service, but it can be slow. High performance (HiPerf) providers can speed up things massively, and the WMI Performance Adapter can be used to provide information on this. Unless

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Back Up Your Config!

If things go wrong, this is your "Plan B"

Does tweaking your services make you a little nervous? Are you concerned about how you can restore your current settings if something goes wrong? You should be. One answer is to back up the Services Settings held in the Registry; run REGEDIT, navigate to HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services, and use File > Export to save that data. Double-clicking the file it produces will restore your settings.

This is a good bit of insurance, but don't be complacent. Turn off a critical service like Remote Procedure Call and your PC may not even boot, making it impossible to use the backup file.

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you're a developer, this is of little utility, and can be disabled.

Proceed with Care

Compare our lists with the services running on your system, and you'll quickly pick out the ones that seem to be unnecessary. So what should you do next?

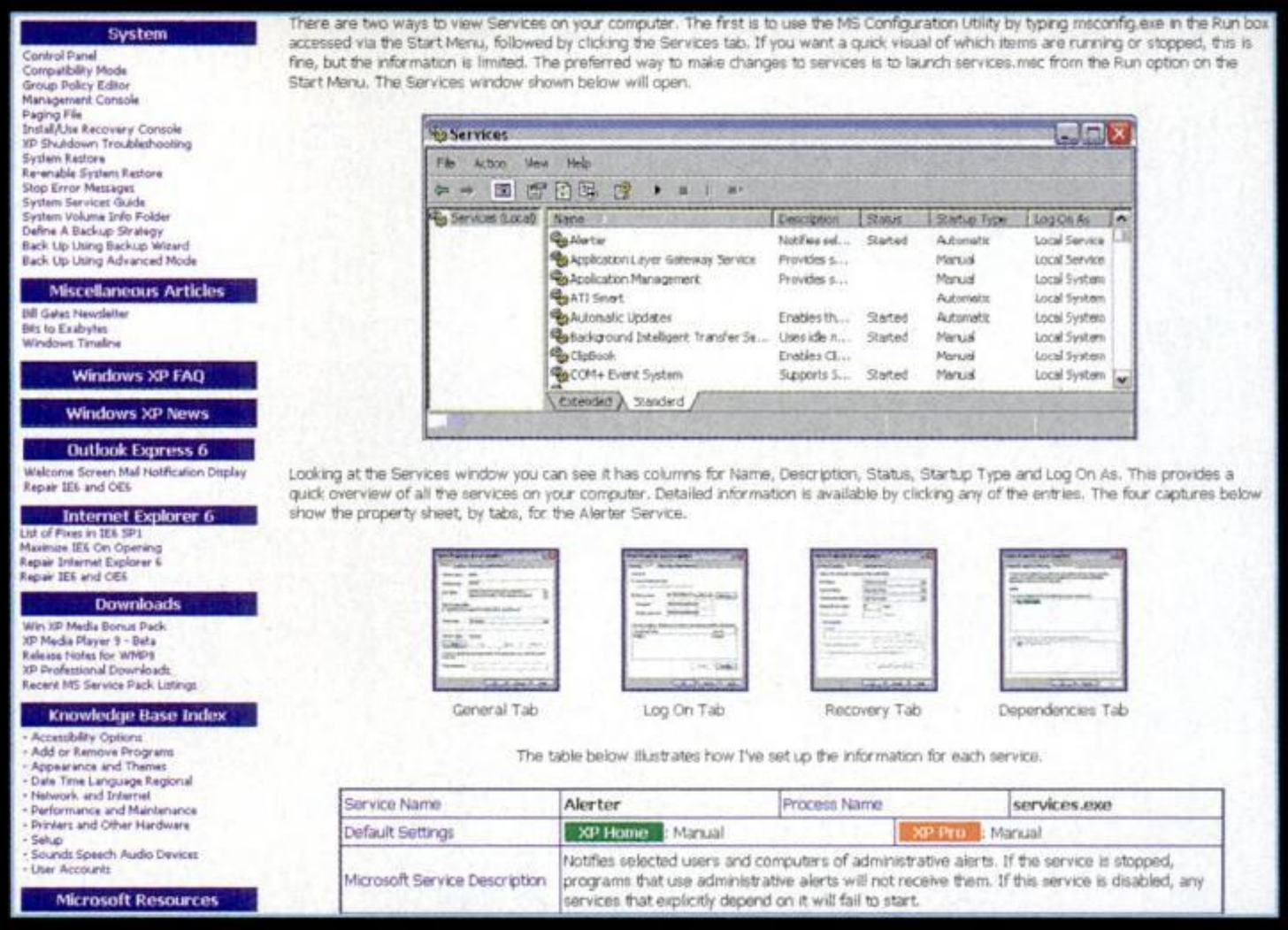
To avoid any potential problems, it's best to proceed with caution. Open the Services console (Start > Run > `services.msc`), and double-click one of the services you suspect is unnecessary. When the Properties dialog appears, select the "General" tab, change its "Startup Type" to "Manual," and click OK. (Change only one service at a time to avoid confusion.)

Once a service has been set to "Manual," it should only be launched if required by an application or another service. The good news is that this means you'll recover a little RAM for your other applications. The bad news? If the service really is required, there may be a noticeable delay at some point while it's launched.

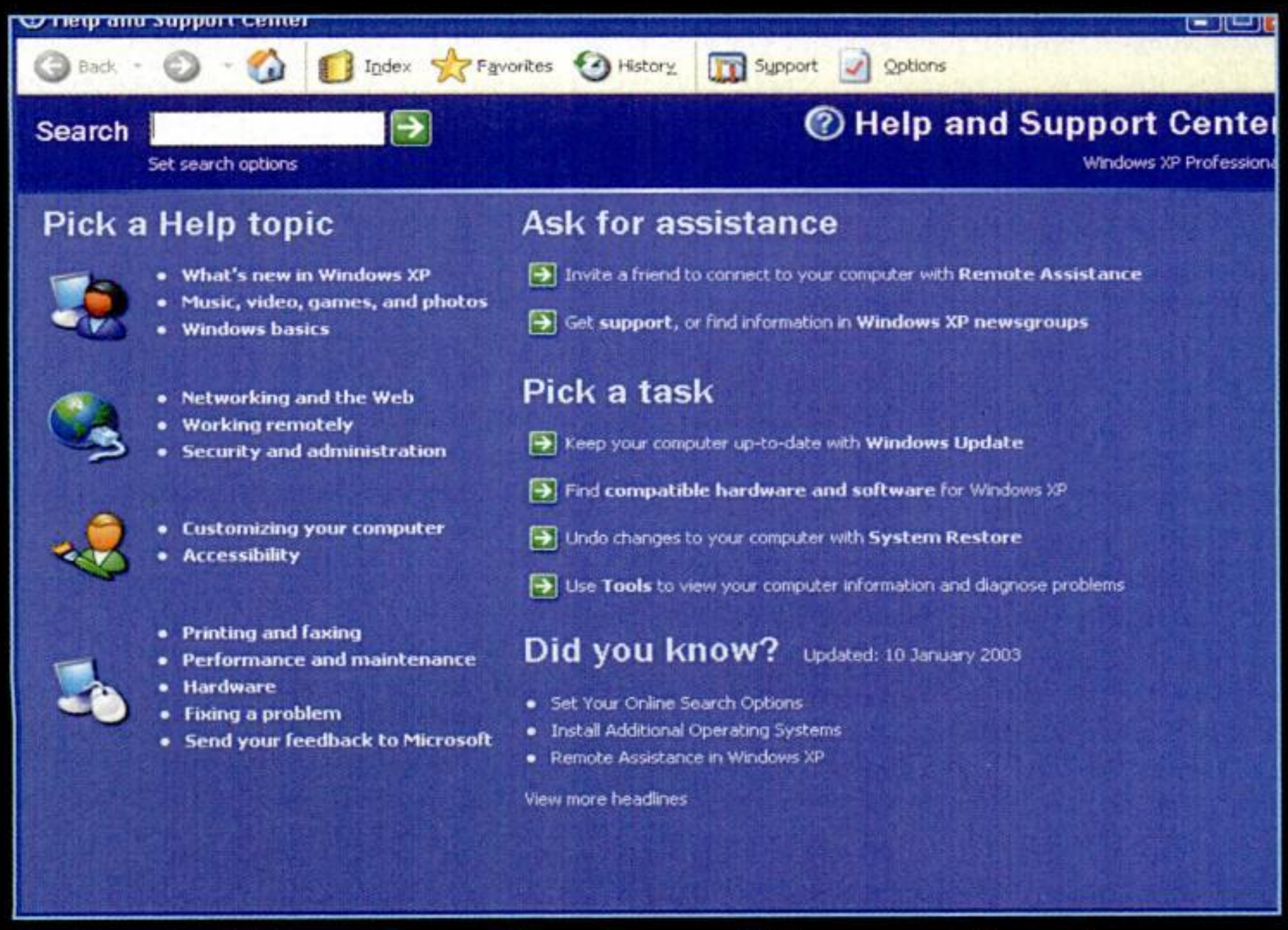
To test this, reboot your PC and check the Services console again. If it's now showing as "Started," then this means another service or application requires it to function. Otherwise, try carrying out functions that relate to what the service is supposed to do (connect to the Internet, browse a networked PC, whatever it might be), then check the service status again. If your PC still works fine, and if the service is not shown as "Started," then it probably isn't required.

You could also set an unwanted service to "Disabled"—but be careful. Do this to the wrong service (Remote Procedure Call, say) and your PC may not even boot properly. It's best to save the "Disabled" option for either services you're 100 percent sure you don't need (Uninterruptible Power Supply), or services you're blocking for security reasons (Telnet, Remote Registry Service, FTP, or Web Server).

Don't let the potential risks put you off, though. Learning how to handle services isn't really that difficult, and is a great way to give your system a performance boost—absolutely free. ■



The Elder Geek has a helpful services section (www.theeldergeek.com/services_guide.htm) among other useful Windows tips.



Services like "Help and Support" can be re-enabled unexpectedly, so keep an eye on your Service Settings to make sure they don't change.

Make a Habit of It

As you'll see from this feature, once you've learned the basics, it really isn't difficult to optimize your Windows services. That's good, because the bad news is that doing this once isn't enough. Install a Windows Update, for example, and you may find the process has restarted some services. The same thing might happen if you install a Microsoft application, and some services ("Help and Support") automatically re-enable themselves if someone tries to use them. So make a habit of reviewing your services on a regular basis, and you'll keep control of your PC.

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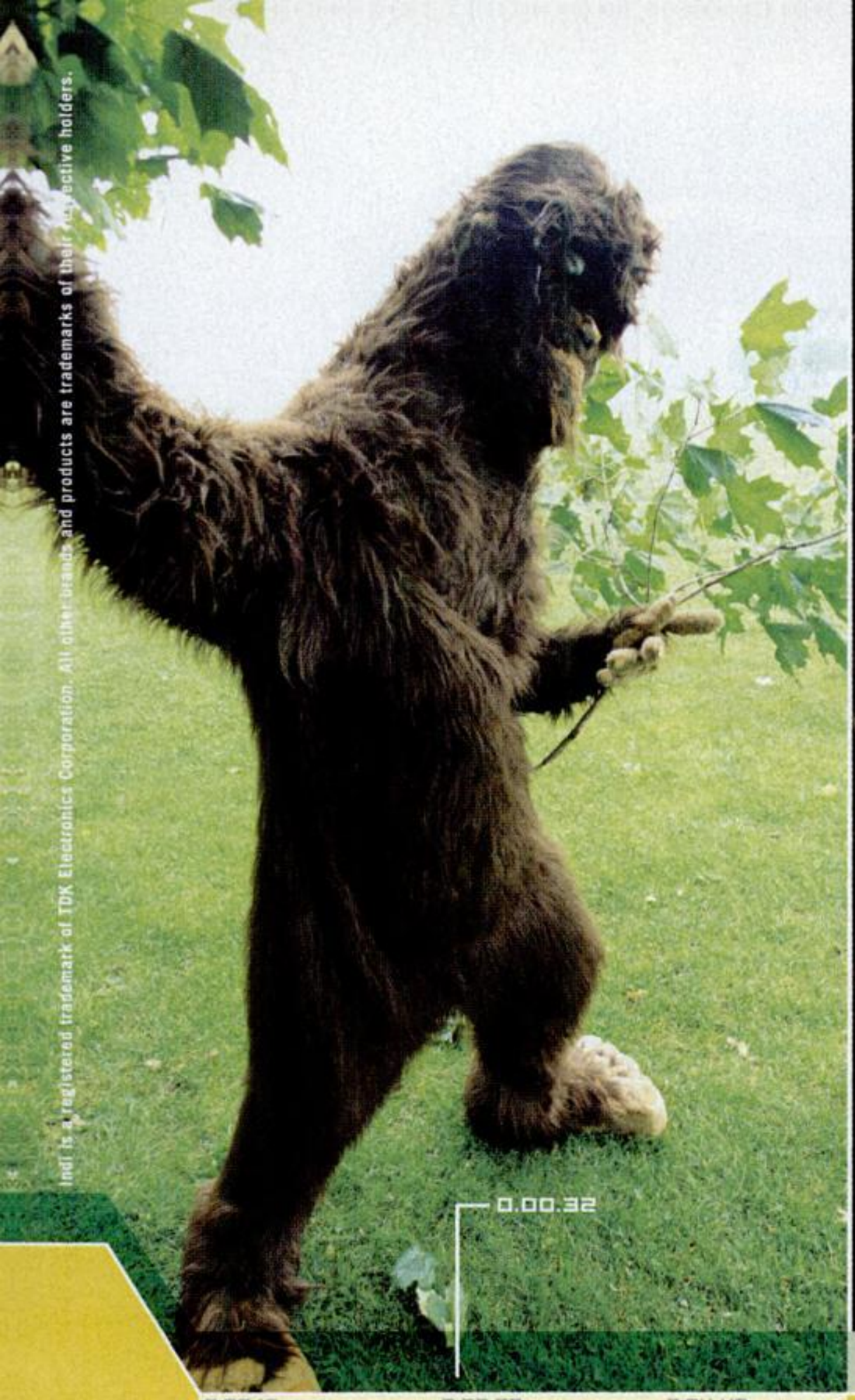

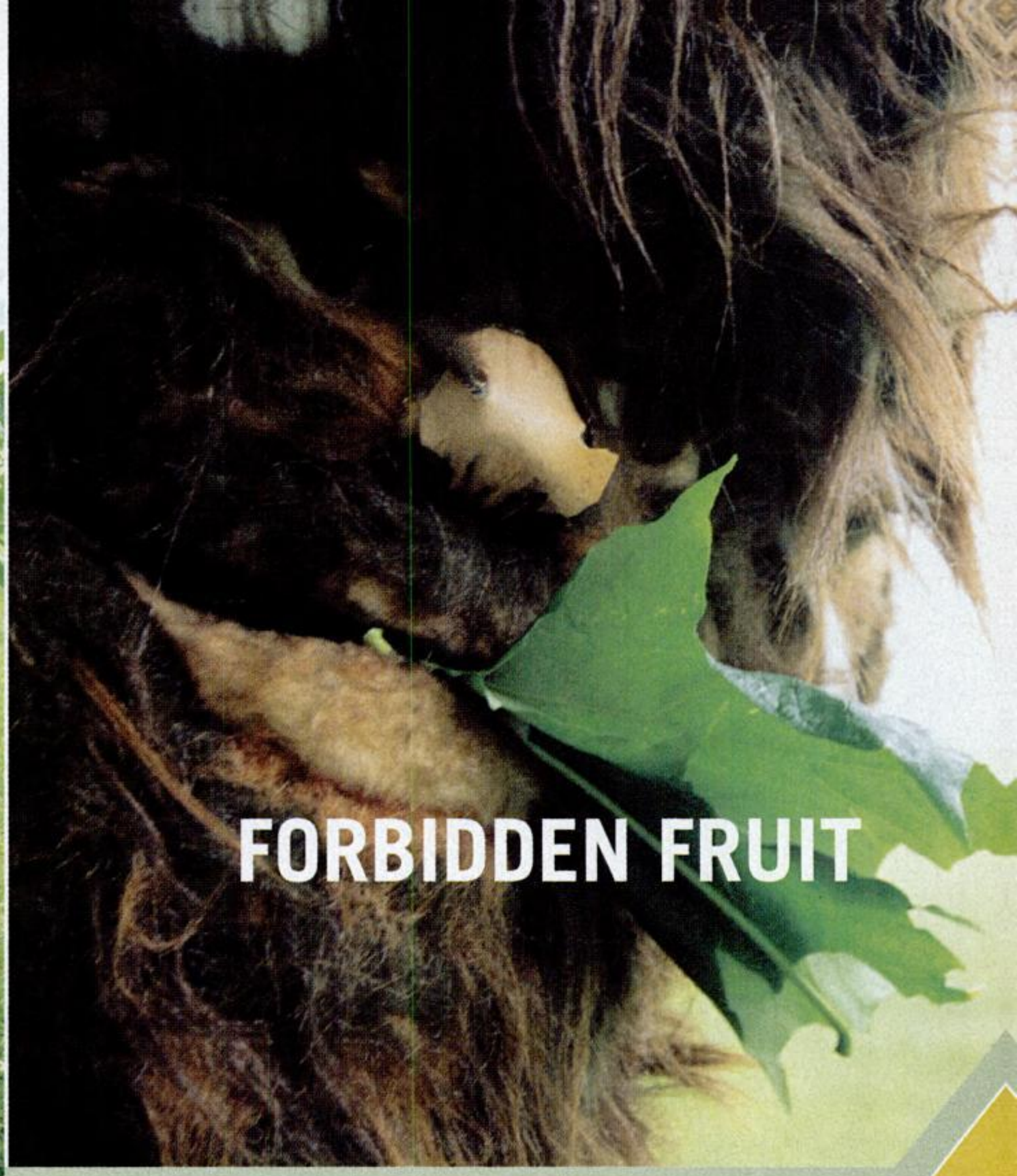

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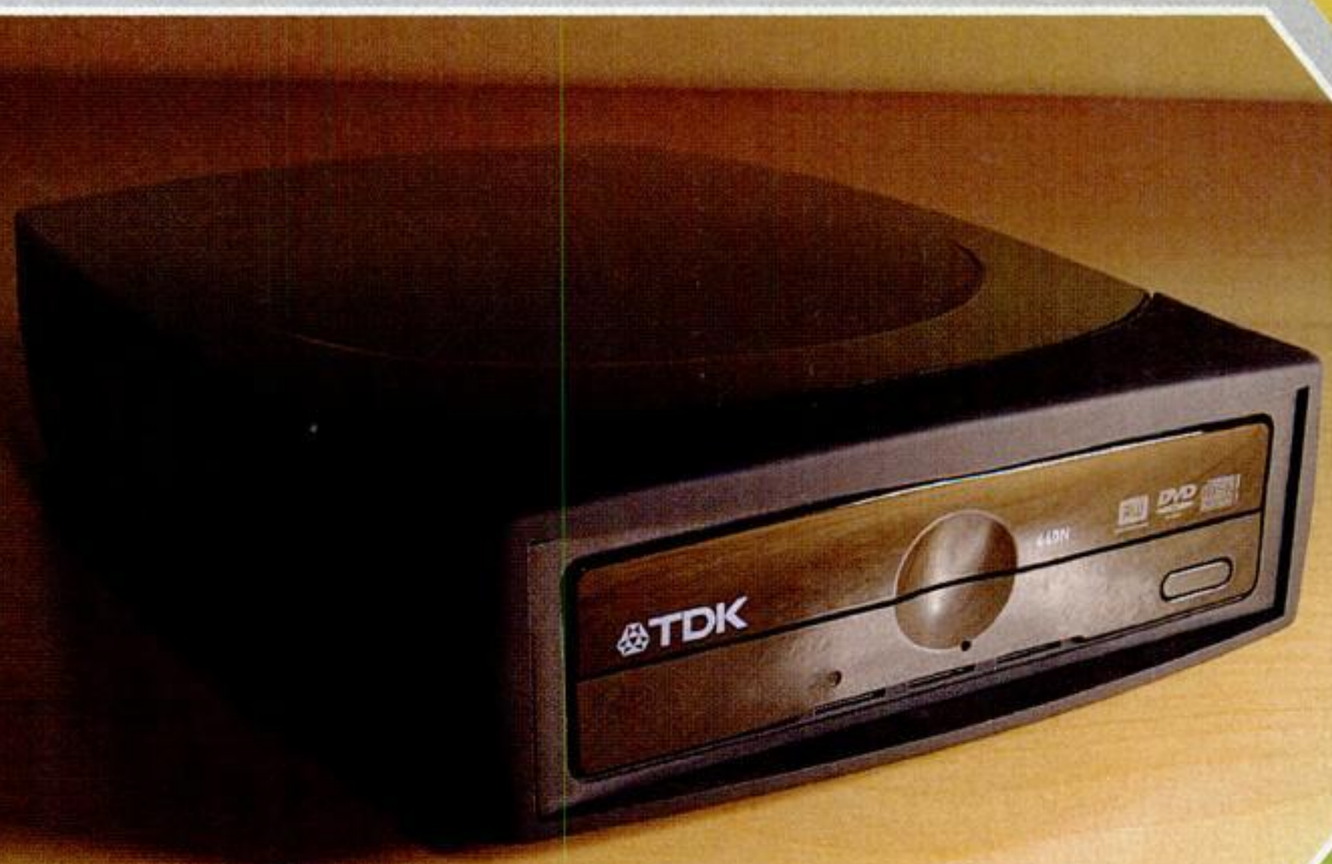

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ATHLON 64 FX-51: RAW SPECS

Clock speed	2.2GHz
Process	0.13-micron with SOI
Die size	193mm²
Core voltage	1.5 volts
L1 cache	128KB
L2 cache	1MB on-die, full-speed
Extensions	3DNow! Pro, SSE2, AMD64
Special feature	Dual-channel DDR memory controller integrated into core
Price	$733 in bulk

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AMD's 64-Bit Gamble

AMD doubles down on its 64-bit wager by releasing Athlon 64 and Athlon 64 FX. Here's everything you need to know about the new chips and AMD's bid to bust Intel's performance advantage.

AMD's back is against the wall. Bleeding cash by the millions and weakened by layoffs from California to Texas, the microprocessor underdog needs a win badly. So this month the company is releasing what it hopes will be an ace in the hole—an innovative new CPU that's designed to steal the desktop crown from Intel.

The new processor is based on the AMD K8 core. AMD introduced this architecture in its Opteron server/workstation chip a few month ago, but this month we're focusing on the just-released desktop iterations of the core, aka Athlon 64 and Athlon 64 FX. The FX is aimed squarely at hardcore home enthusiasts—gamers, video-editing buffs, and back room benchmarkers. The processor boasts an integrated memory controller that runs at full core speed, and can digest both 32-bit and 64-bit code, no performance-bogging emulation required.

It is a Pentium 4 killer by any other name, and AMD is betting the proverbial fab on its success.

A similar scenario played out in 1999. AMD was on the verge of cashing out, but then surprised the world with an ass-kicking CPU called Athlon. Thus began a new era of prosperity in which the Athlon and its descendants won our "CPU of the Year" award three years in a row. But then, in 2002, Intel's Pentium 4 turned the tide with sheer clock-speed horsepower, and has remained the hands-down performance leader ever since.

Flash forward to present day. AMD's new 64-bit CPUs make the original Athlon look like a penny ante—a bid to simply ruffle Intel's feathers. Indeed, the original Athlon was nothing more than an attempt to beat Intel at its own game. The new Athlon 64 and Athlon 64 FX chips, however, are attempts to *change* the whole damn game, its rules and all.

And this time, the stakes are much, much higher. Should AMD succeed—should home consumers and large corporations embrace its interpretation of 64-bit computing—Intel may be caught without a response. Conceivably, Intel could even be forced to adopt AMD's 64-bit approach. To Intel, this would be the ultimate insult. Even worse, such a move could jeopardize Intel's current 64-bit CPU platform, also known as Itanium.

Of course, we're posing a whole lot of ifs: *If* AMD can beat Intel's P4 performance. *If* AMD can get Microsoft to release a 64-bit copy of Windows XP on time. *If* AMD can convince software vendors to port their apps to 64-bit. *If* AMD can get big OEMs such as Dell, Hewlett-Packard, and IBM on board. And *if* the world is even ready for 64-bit computing.

Make no mistake, the new Athlon 64 FX is AMD's all-or-nothing gamble. If AMD wins, it takes home the pot, and maybe even the casino. If it loses, not even a visit to Tony Soprano could save the company. Intrigued? Then read on for the full Athlon 64 story. We'll answer all your upgrading questions and reveal the 64 FX's true performance potential.

ATHLON 64 3200+: RAW SPECS

Clock speed	2GHz
Process	0.13-micron with SOI
Die size	193mm^2
Core voltage	1.5 volts
L1 cache	128KB
L2 cache	1MB on-die, full-speed
Extensions	3DNow! Pro, SSE2, AMD64
Special feature	Single-channel DDR memory controller integrated into core
Price	$417 in bulk

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AMD's 64-Bit Gamble

Q: What are the new CPUs' most compelling features?

AMD is introducing two CPUs to succeed its Athlon XP line: Athlon 64, intended for the masses, and a higher-performance chip called Athlon 64 FX that's aimed at enthusiasts. Both chips have integrated, on-die memory controllers, 1MB of L2 cache memory, and support for Intel's SSE2 instructions, which had previously been exclusive to Intel CPUs. The Athlon 64 will launch at 2GHz and be called the Athlon 64 3200+. Eventually, the Athlon 64 3200+ will replace the Athlon XP, which will be relegated to AMD's budget stable.

For its hot-rod chip, AMD is taking a different tack. The first Athlon 64 FX will be called the Athlon 64 FX-51 and launch at 2.2GHz. Instead of continuing to produce the FX-51 when a new version comes out (perhaps called FX-53 or FX-55), AMD will retire the 2.2GHz proc. This "limited edition" approach is being done to help fortify the FX as an enthusiast part.

The "51" moniker, by the way, is meaningless. AMD says it intentionally picked a new naming convention that bears no specific meaning.

The main difference between the two chips is their respective on-die memory controllers. The memory controller in the Athlon 64 supports the common and easy-to-find unbuffered DDR400 modules that you're probably running in your Athlon XP or P4 rig. Unfortunately, the Athlon 64's controller only offers single-channel bandwidth.

The Athlon 64 FX memory controller, however, supports dual DDR400 channels, just like all the best modern desktop chipsets. The rub? Well, the 64 FX can only use "registered" memory, which is more expensive and harder to find than common unbuffered memory.

Because they employ different memory controllers, both CPUs require different motherboard sockets, and thus different motherboards. The upshot, of course, is that you can't run a vanilla 64 in a 64 FX mobo, and vice versa. If you're

64 FX: Deep Inside the Core

BY PETER N. GLASKOWSKY, PRINCIPAL ANALYST, IN-STAT/MDR

Consider it K7 with a *major* 64-bit add-on

The Athlon 64 FX may or may not be the fastest PC processor on the market—it all depends on which benchmarks you're looking at. But it's certainly the only one that supports 64-bit x86 software. Built on the same chip design as AMD's 100-series Opteron server processor, the Athlon 64 FX shares Opteron's K8 "Hammer" core.

In respect to 32-bit software, there's no magic to the K8 architecture. In fact, it's very similar to the design of the K7 core found in the Athlon XP. Some major features—including out-of-order execution, the translation of variable-length x86 instructions into fixed-length RISC ops (ROPs), and the ability to decode up to three x86 instructions and issue up to nine ROPs per clock cycle—are identical between the new and old cores.

The K8 instruction pipeline is a little longer than the K7 design. One extra cycle in the instruction-decode sequence, as well as one more for integer math, relieve constrictions in the K7 design. This allows the K8 to run a little faster in the same 130nm process. However, the 12-stage effective length of the K8 integer pipeline is still much shorter than the P4's 20-stage pipe. The K8 gets more work done per stage, but the P4 can reach higher clock speeds. These core differences account for the scattershot benchmark comparisons between the two chips. Some programs proceed in a predictable, linear manner, screaming through the P4's integer pipe, with its unique double-pumped ALUs. Other programs jump around a lot, making them a better fit for the K8's multiple x86 instruction decoders.

In its unique 64-bit modes, however, the Athlon 64 FX takes on a whole new look. For software that can take advantage of the AMD64 execution mode, the K8 core has tremendous advantages over the K7. The entire integer subsystem of the K8 core has been widened to 64 bits, so 64-bit adds, subtracts, shifts, and logical operations take place in a single cycle. Multiplying 64-bit integers takes five cycles as opposed to three for 32-bit multiplies, but the wider operation does four times as much work.

AMD64 widens the eight standard x86 registers from 32 to 64 bits, and adds eight more registers to boot. Because some of the basic x86 registers have predefined functions for certain instructions, AMD64 roughly triples the number of general-purpose registers in the CPU. The SSE register set is doubled in size to a total of 16 registers, each 128 bits wide. AMD undoubtedly considered adding more—RISC processors often have 32 integer registers plus 32 floating-point registers, and Intel's Itaniums have 128-entry integer and FP register files. AMD says that 16 registers provide the best bang for the buck, but in time, we may see that it would have been better to add the extra transistors. There may never be another opportunity to make changes of this magnitude to the x86 architecture.

Alas, the 64-bit transition isn't like AMD's earlier addition of 3DNow! extensions to the K6-3D processor. Code in existing applications could be replaced with 3DNow! instructions to provide a performance boost. But AMD64 creates whole new operating modes, not just some new instructions. The new 64-bit performance features are inextricably tied to 64-bit addressing. So, if you're not running an AMD64 operating system, you can't run AMD64 applications.

Recompiling a 32-bit application for AMD64 will increase code size a little (AMD says the SPECint2000 benchmark suite grows about 10 percent), but also reduce the number of instructions executed. So far, AMD's best published benchmark results have been in 32-bit mode, but the company is still working to tune its 64-bit compilers.

AMD knows it will take a while to move its customer base over to 64-bit computing. Though Microsoft will offer a 64-bit version of Windows XP for AMD64, most customers will stick with 32-bit operating systems for a couple more years. Fortunately for these customers—and AMD—the Athlon 64 FX is one of the best 32-bit processors around.

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taking down names, know that the Athlon 64 plugs into Socket 754, and the Athon 64 FX uses Socket 940.

The chips' memory controllers, L2 cache, and SSE2 instructions all provide a performance boost in today's operating systems, games, and applications. But the really big story is that both chips are capable of running in both a 32- and 64-bit mode (just like AMD's server-level Opteron chip, which shares the same basic AMD 64 architecture). We'll get into the benefits of 64-bit computing later in this article, but for now, just know this:

➤ You need a 64-bit OS to run 64-bit games and apps. Currently, the only available 64-bit OS that you'd want to run on a desktop machine is a Linux distribution (the 64-bit version of WinXP is still beta). Never fear, however, because the Athlon 64 chips run x86, 32-bit code without emulation and with no performance hit whatsoever. To wit, as a 32-bit CPU, Athlon 64 FX-51 is the high-performance successor to Athlon XP 3200+.

➤ When a 64-bit version of WinXP does become available, you'll be able to run both 64-bit and 32-bit software on it. Of course, 64-bit software will offer more performance than their 32-bit counterparts, but 32-bit code won't run any slower than it would on a 32-bit OS. In fact, it will probably run a bit faster because the 64-bit OS will be able to address more memory.

Q: What exactly is registered memory?

Registered memory modules, once only required by some workstation and servers, include an additional chip. The extra chip buffers and re-times critical signals to allow reliable operation with DIMMs that have more than the typical limit of 16 or 18 chips. This capability is critical in servers, which need to support as much memory as possible. While the extra chip typically adds one clock cycle of latency, it also increases data integrity, which is important to "enterprise" computing.

AMD doesn't want to force people to buy registered RAM just to run the 64 FX, but it's likely the company couldn't rejigger the Opteron core to support unbuffered RAM in time for its processor launch.

Currently, registered RAM costs

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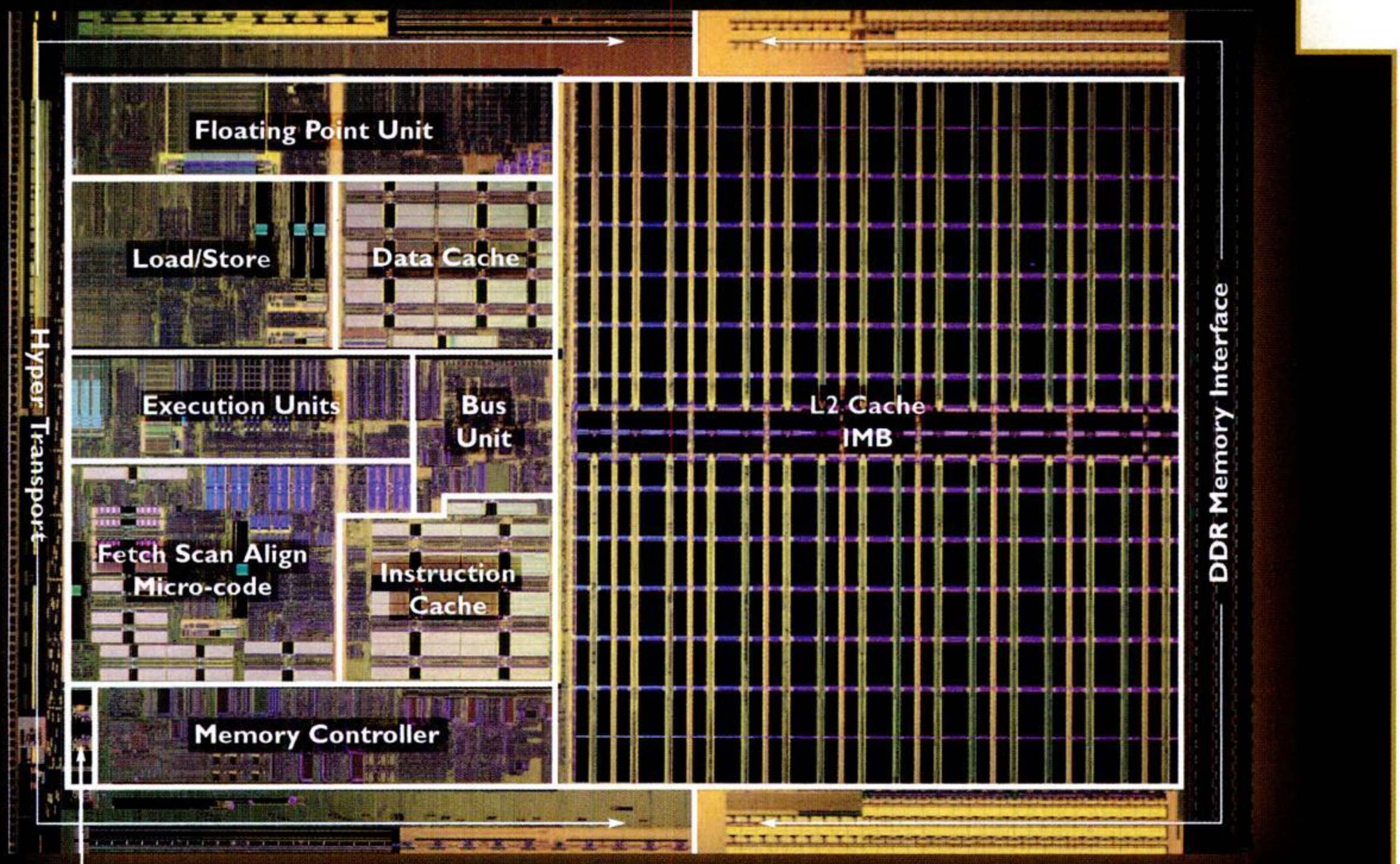

Here's a circuit-level look at the die that's currently used for the Athlon 64 FX and Opteron. When it originally conceived its 64-bit chips, AMD envisioned a server chip (Opteron) with a dual-channel memory controller and a desktop chip (Athlon 64) with a single-channel controller. But then it became apparent that the consumer public would demand a dual-channel desktop chip, so the Opteron die was tapped to do double-duty for a newly created "FX" line. Thus the reason why the 64 FX requires registered memory, just like the Opteron. The vanilla Athlon 64 doesn't need registered memory because it was designed from the ground up as a different chip. Regardless, all three product lines boast a whopping 1MB of L2 cache. Look at all the real estate that sucker takes up!

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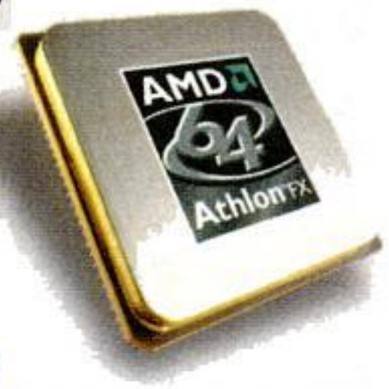
AMD's 64-Bit Gamble



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between 10 and 15 percent more than regular memory, and isn't easy to find in DDR400 trim (we found only one manufacturer: Legacy Electronics). That said, now that the 64 FX demands registered DDR400, you can expect more memory manufacturers to get into the game. It's also possible that some motherboard vendors may actually bundle the required RAM.

Q: What makes an integrated memory controller so desirable?

Every PC needs some type of circuitry that controls the flow of data between the CPU and memory—i.e., a memory controller. Until the advent of the Athlon 64 and 64 FX, memory controllers for mainstream CPUs were built into a motherboard's northbridge chip. (This chip also controls the flow of data to the graphics card and southbridge chip). The problem with this setup is that the constraints of motherboard design don't allow northbridge chips to run at very high internal speeds.

Enter the new 64 and 64 FX. AMD has moved its memory controller directly to the CPU, and in doing so has set the controller to run at the same speed as the CPU. So, in the Athlon 64 FX-51, for example, the memory controller runs at an internal speed of 2.2GHz. Such is the benefit of eliminating circuit board traces altogether!

The immediate benefits of an on-die controller are most apparent in 3D gaming (wait until you see the benchmarks!). Other apps certainly benefit from the increased memory bandwidth, but games currently present the best case for on-die control. Now, at this point you may be wondering how a 2.2GHz memory controller can provide extra performance when the 64 FX's DDR memory is running at only 400MHz. Well, it always helps to alleviate any bottleneck, and increasing the controller speed does just that. But AMD says we'll also benefit from lower latencies (latency is the length of time the CPU has to wait for the memory to respond to requests). AMD estimates that the Athlon 64 and 64 FX have a latency of 50 nanoseconds, or roughly half that of a Pentium 4 on an 800MHz bus, and this lower latency is available right now in 32-bit computing.

But, once again, we have to remind you that the on-die memory controller will limit your upgrading opportunities. If you buy a 64 FX system this month, it will come with DDR400 memory, as required by its memory controller. When DDR2 memory comes out next year, you'll have to ditch both your FX-51 motherboard *and* your CPU in order to join the new memory world order.

Q: How fast might the Athlon 64 family scale during its lifetime?

Intel freely brags that its current P4 architecture could scale to 10GHz if necessary, but AMD isn't making any predictions on the clock-speed ceiling of AMD64. However, one indicator of how fast the current Athlon 64 family can scale is its pipeline. The new Athlon 64 family features a 12-stage pipeline. That's two more stages than that of the Athlon XP, but far short of the 20-plus stages in the Pentium 4.

While longer pipelines generally allow for faster clock frequencies, AMD is perfectly confident that its approach to performance will be proved superior. AMD's John Crank, senior associate brand manager, says, "There are two ways to skin a cat. You can take either the extreme of high IPC [instructions per clock] and low frequency, or low IPC and high frequency. We have a pretty balanced attack on how much throughput the processor has. We like that balance... Frequency is only half the game. There is no wrong solution. There is no right solution. You just try to find the right balance."

"FREQUENCY IS ONLY HALF THE GAME. THERE IS NO WRONG SOLUTION. THERE IS NO RIGHT SOLUTION."

Q: What's the difference between Athlon 64 FX and Opteron chips?

Both CPUs currently use the same Socket 940 interface. In fact, one could argue that the 64 FX is just an Opteron that's been nipped and tucked. To wit: All Opterons have three HyperTransport I/O links for connectivity to 64-bit PCI-X slots and, eventually, multi-lane PCI Express slots. While mandatory for workstation and server motherboards, consumers have little need for these high-speed I/O connections, so AMD intentionally disabled two HyperTransport links in the 64 FX chip, and left it with just one. This chip surgery, along with BIOS incompatibilities and a lack of cache coherency, will prevent people from using Athlon 64 FX chips in Opteron motherboards.

But besides these differences—and the fact that the 64 FX chips run at higher clock speeds!—the two CPU types are nearly identical.

Q: What's the wisdom behind waiting for the Socket 939 version of the 64 FX?

Sometime next year, AMD will likely tweak the 64 FX's memory controller to support unbuffered DDR RAM, and maybe even add a DDR2 controller. When it does this, AMD will move the 64 FX to a new Socket 939 interface. Socket 939 will be incompatible with Socket 940 and vice-versa.

Once again, AMD places another hard divider between its server/workstation CPUs and its desktop CPUs. Nonetheless, AMD has told *Maximum PC* that it is committed to offering 64 FX in Socket 940 trim through 2004. So when a new version comes out in Socket 939, the same clock speed should also be available in Socket 940. What's more, AMD will probably time the release of Socket 939 with the release of PCI Express, which will require people to buy new mobos anyhow.

If you can stand the wait, it might make sense to idle until the middle of 2004 for Socket 939. But, of course, there will always be a more interesting technology looming on the horizon, so there's really no perfect time to pull trigger.

Q: Which mobo vendors have announced Athlon 64 products?

The usual suspects are getting into the game—ASUS, MSI, ABIT, Gigabyte, DFI, and Chaintech. Again, we can't reiterate this enough: Your current Athon XP and Opteron mobos will not support the new chips.

Q: Which core-logic chipsets support the new procs?

AMD is focusing all of its core-logic attention on the multi-processor side of

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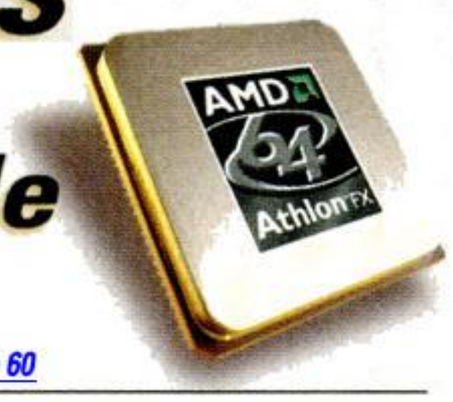
AMD's 64-Bit Gamble



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its business, so it will not be making a chipset for the 64 or 64 FX. The desktop market will be left to the same third-party vendors that have made a living selling chipsets for the Athlon XP during the last two years.

The first chipsets for AMD's new CPUs include nVidia's nForce3 150, which supports AGP 8x, USB 2.0, UltraATA 133, and fast Ethernet. Later this year, nVidia will release the nForce3 250, which adds four Serial ATA ports, RAID support, and a set of software tools to let you tweak the PC from within the OS. A third version called nForce3 250Gb will add Gigabit Ethernet that offers performance on par or slightly better than Intel's CSA.

All these nForce3s are single-chip solutions that do away with the northbridge/southbridge construct. Noticeably missing from the chipsets are the advanced 5.1 audio capabilities that have been such a hit in the nForce2. nVidia says it's still committed to audio, but will move it to a discrete solution. We take this to mean that nVidia is developing a PCI Express soundcard that offers all the goodness that used to be hardwired into its chipsets. So watch out, Creative Labs.

VIA, meanwhile, has a new K8T800 chipset on tap. The K8T800 offers native support for Serial ATA, Serial RAID, parallel ATA133, and USB 2.0, and can run up to 4GB of RAM. Unlike the nForce3, the K8T800 maintains the traditional northbridge and southbridge architecture. We've yet to see any Athlon 64 FX with anything but nVidia's nForce3, but we've heard rumors that VIA's K8T800 may be a bit faster.

Keep in mind that previous VIA and nVidia chipsets were in large part defined by their respective memory controllers. Because memory control is now wired into the CPU die, the chipset companies can only shine by increasing IDE and AGP performance. In other words, we wouldn't expect huge performance differences between the nVidia and VIA chipsets.

Q: OK, enough about the hardware. What's the big deal with 64-bit computing?

It all comes down to memory. Today's fastest 32-bit desktop CPUs—Athlon XP and Pentium 4—can only address 4GB of RAM. But 64-bit CPUs, like those in the new Athlon 64 family, can address a whopping 256 terabytes of RAM.

Do our PCs really need to address more memory? After all, today's highest-end desktop rigs usually do just fine with 1GB or 2GB, tops. Well, what it really comes down to is that the vast majority of desktop users don't need more than 4GB today, but they will in a few years, and if we're all to be prepared for the future, companies like AMD have to anticipate the need with processors like the 64 FX. Or so the reasoning goes. Who knows, maybe Windows Longhorn (Microsoft's next major OS release, rumored to have a 3D interface) will require crazy-large amounts of RAM. But we do know that game developers would love to design games for systems running excessive amounts of memory. Even today, some massively multiplayer games, rife with incredible amounts of models and textures, can make good use of 1.5GB.

AMD argues that main system memory requirements tend to double about every 18 months. Thus, with the price of memory continually decreasing, and memory requirements continually increasing, it's really not too far fetched to expect desktop PCs with 4GB in two to three years (just think back on the days when people thought 64MB was overkill!). By designing a CPU architecture that can offer no-excuses performance in both 32- and 64-bit, AMD thinks it has the ultimate chip for the possibly ugly transition from 32- to 64-bit computing.

Q: Doesn't Intel already have a 64-bit chip?

Yes, but the Intel Itanium was designed to cater to the server and high-end workstation market, and doesn't offer serious support for x86 32-bit code. It can, however, run 32-bit code, but does so with a massive performance hit. While we've never tested it, many people say the performance of an 800MHz Itanium running 32-bit x86 code is somewhere at the Pentium II level. A second-generation chip called Itanium 2 is faster in both 64-bit and 32-bit, and looks to be finally gaining some traction, but Intel's 64-bit solution is still firmly planted in the high-end server market where it battles Sun and IBM.

It's unlikely that Intel has plans to move Itanium to the desktop, and the company will clearly be in a bind if the Athlon 64 family gains serious momentum in the desktop space.

Q: Which desktop OSes and software currently run in 64-bit?

There's not too much available right now—a 64-bit version of WinXP (beta and not available to the public), a 64-bit GNU Linux OS (beta but public), and a 64-bit port of *Unreal Tournament 2003* (which

What Will Be Intel's Response?

Intel's announcement of a Pentium 4 "Extreme Edition" is an obvious response to the Athlon 64 FX. The new chip's only significant feature is a gigunda 2MB L3 cache. Sound familiar? Indeed. The Extreme Edition is basically a repackaged Xeon server/workstation chip. Prescott, of course, will be Intel's real response to AMD. This next-gen processor, which might even be released before the end of the year, features a 90nm process, 1MB of L2, improved Hyper-Threading, and new instructions (aka SSE3).

Will there be 64-bit code lurking in the core of the new Pentium 4?

One question that everyone is asking is whether Intel will include 64-bit extensions in Prescott. Some pundits are speculating that a clone of the AMD64 architecture will be in the chip but not turned on for the public. Intel won't comment on Prescott's possible 64-bit support. But even if the new chip does run 64-bit code, why would Intel borrow code from the AMD playbook? Well, the strategy would serve as a great hedge bet in the event that AMD is successful in garnering 64-bit application support. If software developers jump on the 64-bit bandwagon, Intel could swallow its pride and easily flip on its 64-bit support.

Nonetheless, Kevin Krewell, a senior analyst with *Microprocessor Report*, says the likelihood of Intel adapting AMD extensions in Prescott is "slim to none." After all, for its 64-bit architecture, AMD dropped the neutral "x86-64" moniker for the much more branding-conscious "AMD64." While it's entirely conceivable that Intel would feel comfortable announcing support for x86-64, it would probably never proclaim support for AMD-branded extensions.

Krewell says it's a better bet that Intel will come up with its own large memory addressing strategy. Such a move would respond to AMD's initiative to provide users with more memory, as well as give Intel more time to push Itanium, and improve Itanium's 32-bit performance. If Microsoft is willing to support this plan, Intel's marketing machine and war chest could scuttle the AMD64 movement before AMD gains desktop dominance.

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Why AMD Still Faces a Tough Road Ahead

You may be impressed by the Athlon 64 FX-51, but don't be fooled into thinking it's a cakewalk for AMD from here on out. The company still faces obstacles. The first is die size.

AMD has long had a die-size advantage over Intel because the Athlon XP has generally always been smaller than the Pentium 4, and a smaller die allows a company to fab more CPUs per wafer. This increases efficiency, saving money. For example, the AMD Barton core measures about 101mm^2 while the P4 is 146mm^2. The Athlon 64 and FX-51, however, use the same die and measure a whopping 193mm^2. Intel's new Prescott will probably measure about 120mm^2.

With the ability to make more dies per wafer, Intel will find it easier to put the price squeeze on AMD. Don't expect AMD to see any production relief until it produces is own 90nm Athlon 64s and FXes in the later half of 2004.

Even more ominous is the question of who will actually make AMD's chips. Analysts at In-Stat say it took AMD three years to produce the first Athlon chip at its fab in Germany. Meanwhile, according to Kevin Krewell, a senior analyst with *Microprocessor Report*, AMD is already too late in building a 65nm fab—a facility that would need to be online by 2005 in order for AMD to be competitive with Intel's own 65nm process technology. Krewell says AMD may have to tap IBM to fabricate its chips on a 65nm process. All this leads to the conventional wisdom that, by 2007, AMD may become like nVidia and ATI, and rely on partners to fab its chips.

Krewell says the other huge X-factor is Microsoft. Will Microsoft release an OS that supports an Intel-based memory-addressing scheme? Such a move would seriously deflate AMD's attempt to build support for its 64-bit chip.

Can AMD survive on the FX-51's screaming performance, and that alone?

Epic has merely demoed).

The huge question, of course, is Microsoft support. Although the Galactus of operating systems has committed to a version of WinXP for AMD 64 (likely called Windows XP 64-bit Edition), a release date hasn't been announced. However, scuttlebutt has it that the OS may be ready by December 2003 or Q1 2004. We've played with a beta version and it seems fairly stable and near completion.

Microsoft currently has no plans to offer WinXP 64-bit Edition in a traditional shrink-wrap package. The OS will apparently only be available for download or distributed with new systems. But, of course, the Athlon 64 family can run current OSes—Win98, XP, whatever—without any emulation penalties.

Q: What do the major game developers have to say about 64-bit CPUs?

Epic's Tim Sweeney, the brain behind all the Unreal engines, told *Maximum PC*, "AMD's approach provides a great way for the industry to transition from 32-bit to 64-bit smoothly. You buy a cost-effective CPU, and you can run 32-bit software with great performance, as well as 64-bit software with great performance and a large memory size."

Epic has plans to release a native 64-bit version of *UT2003* at Comdex, as well as a 64-bit patch for existing copies of the game. "With this game," Sweeney says, "there isn't any dramatic benefit to 64-bit, but our next generation will take significant advantage of 64-bit, especially on the content-creation side."

In the here and now, Sweeney says the Athlon 64 family has a leg up on performance thanks to the on-die memory controller. "Current CPUs have about 100,000 times the computing power of the Apple II, but memory latency has improved by less than 10x. Larger caches have made up some of the difference, but apps that use large amounts of memory still suffer greatly. The on-die memory controller reduces memory latency significantly, by about 2x, so it's a very welcome addition."

Q: How much performance difference will I see going from a 32-bit app in a 32-bit OS to a 64-bit version of that app in a 64-bit OS?

It's impossible to say without benchmarking, but AMD says it has seen real-world performance boosts of 25 to 600 percent depending on the application and task. We'll reserve judgment until we have some OSes and apps to make a call.

Q: Will current desktop hardware even run a 64-bit OS?

The transition to WinXP 64-bit will require new device drivers. AMD says hundreds of hardware vendors are signed up to rewrite drivers, but we can surmise from past experience that many, many drivers will never be rewritten. Will your Sound Blaster Audigy 2 work in the new 64-bit OS? Undoubtedly, yes. Will you get your Aureal 2 card to work? Hah! That's rich.

If you're particularly smitten with an obscure Ultra SCSI controller or TV tuner, you better check with the manufacturer to see if it will support the 64-bit version of Windows.

Q: What are the key differences between Athlon XP and Athlon 64 FX?

Athlon XP is, of course, just a 32-bit chip. But besides offering twice the L2 cache of the Athlon XP and an integrated memory controller, the 64 and 64 FX also use a longer pipeline and "Silicon On Insulator" (SOI) process technology. The last main difference is that Athlon 64s feature an integrated heat spreader that helps dissipate heat by making better contact with the heatsink. This spreader also helps prevent the cracking problem had by clumsy people installing Athlon XPs.

Q: What's the benefit of SOI?

The process involves laying down a layer of Silicon Dioxide that serves as an insulator between a chip's transistors and silicon substrate. The Silicon Dioxide layer reduces the capacitance of the transistors, which allows them to switch their on/off states more quickly, and this fosters higher clock speeds.

Q: Is it true that SOI impedes overclocking, and that the new architecture's on-die memory controller won't even allow overclocking?

Not true at all. AMD and chipset vendors have also told us the Athlon 64 FX-51 overclocks quite nicely. In fact, when we met with AMD to discuss the new high-end chip, the company's main rep gave us one of the hardiest public endorsements of overclocking that we've ever heard from one of the Big Two: "We don't support overclocking because we don't validate the overclocked processors, but to the extent that someone overclocks and it works, that's great!"

Q: Is it true that AMD won't ship Athlon 64 in volume until it moves to a 90 nanometer process?

Yes and no. AMD says it will have enough

continued on page 64

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AMD's 64-Bit Gamble

continued from page 63

Athlon 64s and FXes to satisfy what will likely be limited consumer demand at launch. By the time interest in the chips really takes off (maybe a year from now), the company will have moved from 0.13-micron CPUs to 0.09-micron CPUs. This is the scenario AMD anticipates, but it may play out differently. Please consider that the die size of the Athlon 64 and 64 FX is almost twice that of the Athlon XP, so it can't produce as many chips per wafer. Thus, AMD could face huge problems if it can't get its 90nm process going on schedule.

Q: What's going to happen to Athlon XP?

AMD will continue to sell the Athlon XP through 2005, but it probably will not increase chip speeds. This makes the Athlon XP 3200+ the last of a dying breed.

Obviously, rumors of next-gen Athlon XPs being called Athlon FX are flat-out wrong. There are no next-gen XPs, and "FX" solely denotes Athlon 64 parts. Don't feel bad if this information leaves you feeling stupid, as even *Maximum PC* bought the hype after seeing one motherboard maker add support for "Athlon FX" to its Socket A board. D'oh!

Another rumor circling the Internet is that AMD will be moving Athlon XP to a Socket 754 shared with Athlon 64. AMD would neither confirm nor deny any such product, but we don't think it will see the light of day. For its 64-bit architecture to thrive, the company needs to force the 64-bit issue. Athlon 64 FX offers the perfect compromise, so AMD wants people buying into this new world order. If the company makes it easy for people to hold onto their 32-bit-only chips forever, it only does harm to its 64-bit platform.

Q: How does Athlon 64 FX compare to the Pentium 4?

Very well, in fact. The performance of the Athlon 64 FX-51 is outstanding in many benchmarks. You can read the test reports on this page, but it's safe to say that AMD has jumped back in front in many areas.

Battle of the Benchies

The 64 FX-51 puts AMD back in front—and just in time for *Half-Life 2*!

It may be years before you see any benefit from the 64-bit capabilities of the Athlon 64 FX, but in the here and now, the chip is one fast mutha—and the new king of the desktop hill.

To test AMD's would-be golden boy, we directly compared it with similarly configured Pentium 4 and Athlon XP systems. Here are the configs of our test beds:

➤ ATHLON 64 FX: 2.2GHz Athlon 64 FX-51, ASUS SK8N motherboard, and two 512MB Legacy Electronic registered DDR400 DIMMs.

➤ PENTIUM 4: 3.2GHz P4C, ASUS P4C800 Deluxe motherboard, and two 512MB sticks of XMS4000 Corsair Micro RAM in dual-channel mode.

➤ ATHLON XP: 2.2GHz Athlon XP 3200+, ASUS A7N8X Deluxe motherboard (Rev 2.0), and the same pair of XMS4000 Corsair Micro DIMMS.

All three systems were outfitted with the same ATI Radeon 9800 Pro videocard, and each used a 120GB Western Digital WD1200JB hard drive and Windows XP Pro with SP1. You'll notice that our P4 is running at its current-fastest clock frequency; we didn't clock it down to 2.2GHz in order to attempt a more "apples-to-apples" comparison. The fact of the matter is that Intel and AMD each have a different strategy to achieve higher performance: Intel opts to let sheer clock speed muscle its way through benchmarks, while AMD eschews raw clock speed in favor of a more efficient design. Is one strategy "better" than the other? Not as far as we're concerned. We don't care how a processor gets to the finish line, as long as it gets there first. So if you have a problem with our decision to run a 3.2GHz P4, keep it to yourself. This is a showdown between each company's best desktop effort.

And the Winner Is . . .

Given that the FX-51 was hobbled by a 1GHz clock-speed handicap, we can only conclude that the AMD64 architecture is otherworldly efficient, because AMD won most of the important benchmark battles. Consider: In every gaming-related test we ran, the Athlon 64 FX-51 finished first. *Quake III*—first. *Comanche*—first. *Unreal Tournament 2003*—first. *3DMark2001* and *2003*—first. The Athlon 64 FX-51 simply schooled the P4C (and of course the Athlon XP 3200+) in 3D games. One can only surmise that the integrated memory controller and extra L2 cache come in huge and handy.

The P4 had the highest overall score in *SYSmark2002*, but only because it so thoroughly dominated the content creation portion of the testing package. The *SYSmark2002* suite runs 14 different real-world apps, and then spits out three different numbers: one score for the performance of content creation apps, one score for office productivity apps, and one that averages out the two separate scores. As you can see from our benchmark chart, Intel dominated at content creation to such a high degree, it was able to squeak out a three-point lead in the cumulative score. Regardless, it's important to note that AMD says *SYSmark2002* is Intel-biased. Hopefully, the situation will be erased by *SYSmark2004*, which has received the blessings of both Intel and AMD.

In our *Premiere* action script—which takes an AVI, adds an MP3 audio track and transitions, and then encodes everything to WMV—the Athlon XP has always trumped the P4. Well, AMD's dominance in this test continues, because the 64 FX finished well ahead of the pack. One large caveat, however: *Premiere 6.01* is full of old, unoptimized code. When we ran our same action script in the beta version of *Premiere Pro* (which has been recompiled and completely rewritten for multithreading), the Athlon XP and Athlon 64 FX were slower than the P4. We predicted this result a few months ago, and it looks like we were right. In fact, as more applications are updated to support SSE2 and Hyper-Threading, and are optimized for the P4's long pipeline, Intel silicon will score better and better benchmarks.

In our search for the most benchmarking data possible, we threw a few synthetic benchmarks into the mix. In *ViewPerf 7*, which measures how fast a system can render OpenGL tasks in a number of high-end 3D design apps, the Athlon 64 FX-51 took four of six tests. The FX-51's floating-point dominance also outstripped the P4 in the distributed computing client, *SETI@Home*. No surprise here, folks. When your app is FPU-intensive, reach for Athlon 64.

Not everything was sour for the P4, though. Intel's clock-speed advantage proved essential in a host of tests, including *MusicMatch 7* and *8*. For these two tests, we use *MusicMatch* to encode a WAV file to a high-quality MP3—a task seemingly designed for the P4. Intel also took the gold in a set of action scripts it designed for Adobe *After Effects*, a special-effects package for video editors. That wasn't a surprise, of course, but wouldn't it have been interesting if the FX-51 won? The P4 also took victory in Discreet's *Cleaner XL*, a media-encoding application that's popular among the prosumer crowd. So what's going on here? Well, one can surmise that the P4 does well with code that requires

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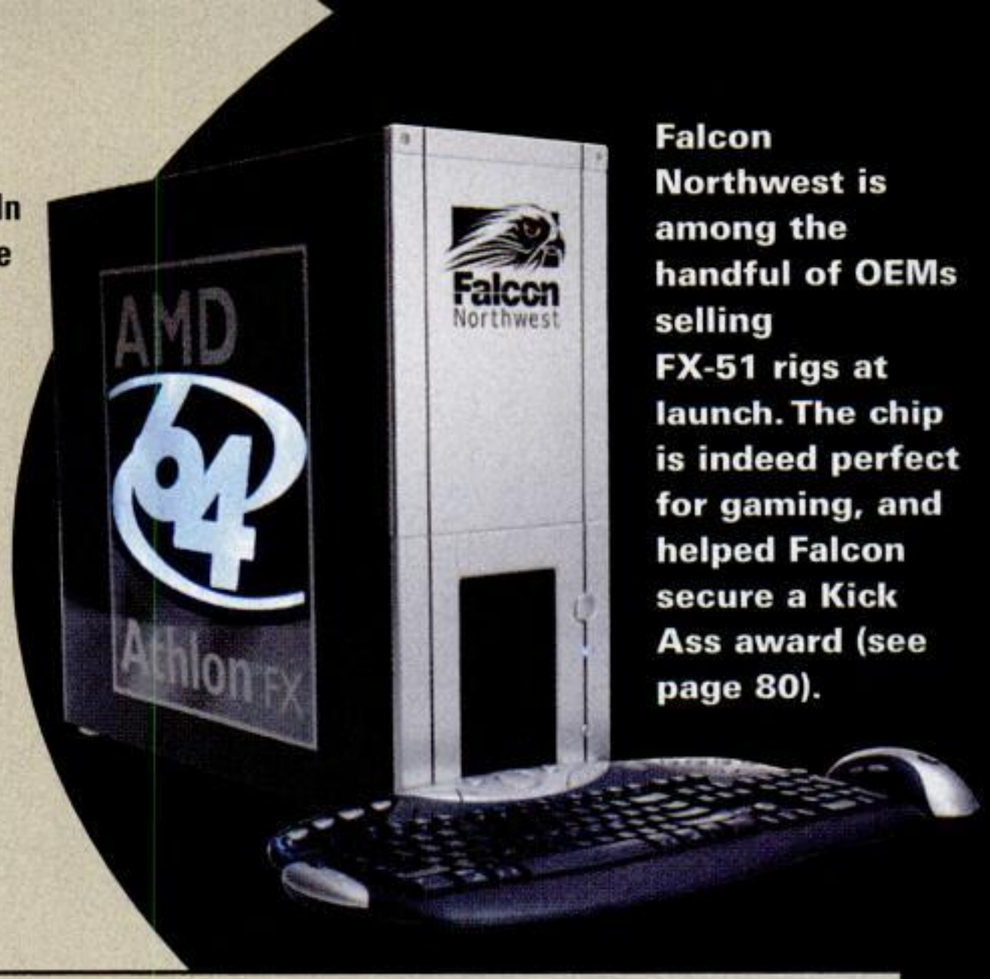
a lot of predictable, repetitive computations—like media-encoding. But with code that needs to "jump around a lot," as Peter N. Glaskowsky puts it (see page 58), the P4's long, long pipeline can introduce slowdowns during branch-prediction misses.

The Final Word

The big loser in the competition is the Athlon XP. The once-stellar value alternative is now looking old and moldy. But no one at AMD is crying because the Athlon 64 FX is such a compelling product. It's the new processor of choice for any current games, and probably any games on the horizon. It's also the leader of the pack in older apps that are floating-point-intensive. In fact, just about any app that favored the Athlon XP now runs even faster on the Athlon 64 FX.

The 64 FX also benefits from SSE2 support to make it well-balanced for newer applications. Just keep in mind that in new applications that have been coded to get the most from the P4, Intel's flagchip still has plenty of performance life left in it. And once Intel pushes out its Prescott CPU later this year, the tables may turn once again. But for now, Athlon 64 FX is king.

All hail Athlon 64 FX! ■



Falcon Northwest is among the handful of OEMs selling FX-51 rigs at launch. The chip is indeed perfect for gaming, and helped Falcon secure a Kick Ass award (see page 80).

DARE to COMPARE: High-End Desktop CPUs

Benchmarks	2.2GHz Athlon FX-51	3.2GHz Pentium 4C	2.2GHz Athlon XP
SYSmark2002 Overall	312	**315**	265
SYSmark2002 CC	409	**445**	342
SYSmark2002 OP	**238**	223	206
SiSoft Sandra 2003 Integer	**5556**	4381	2792
SiSoft Sandra 2003 Floating-Point	**5491**	4399	2613
Quake III	**444 fps**	376 fps	327 fps
Comanche	**70 fps**	60 fps	52 fps
UT2003 Demo Flyby	**271 fps**	234 fps	228 fps
UT2003 Demo Botmatch	**98 fps**	79 fps	74 fps
3DMark2001 Overall	**19,943**	17,709	16,961
3DMark2003 Overall	**5869**	5738	5618
3DMark2003 CPU Test	**839**	679	624
Premiere 6.0.1	**254 sec**	340 sec	279 sec
Premiere Pro Beta	431 sec	**399 sec**	496 sec
ViewPerf 7.0 3DSMAX	12.05 fps	**12.43 fps**	10.90 fps
ViewPerf 7.0 DVR-08	**43.17 fps**	35.96 fps	39.88 fps
ViewPerf 7.0 DX-07	**68.29 fps**	66.86 fps	63.72 fps
ViewPerf 7.0 Light-05	12.80 fps	**12.82 fps**	11.12 fps
ViewPerf 7.0 ProE-01	**14.27 fps**	13.12 fps	12.80 fps
ViewPerf 7.0 UGS-01	**26.87 fps**	22.96 fps	23.86 fps
MusicMatch 7.1	164 sec	**141 sec**	171 sec
MusicMatch 8.0	133 sec	**116 sec**	140 sec
SETI@Home TLC Unit	**105 min**	133 min	136.7 min
After Effects 5.5	482 sec	**403 sec**	661 sec
Cleaner XL convert AVI to MPEG2	336 sec	**272 sec**	345 sec

Best scores are bolded.

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the MAXIMUM PC CHALLENGE

This month: Memory Meltdown

How much brazen overclocking can DDR take before going boom?

The Maximum PC Lab: Is it a clean and controlled benchmarking facility, or a depraved chamber of horrors in which innocent components are tested to completion just for kicks? That's a question we'll refrain from answering directly, but judging by all the dead components we have festooned around our Lab benches, one can surmise that, yeah, we've cooked a few parts in our day.

All of which leads us to a new recurring feature, The Maximum PC Challenge. Our goal? To put components through the harshest stress-tests our sick minds can think of. This month, we train our sights on DDR memory.

Today's fastest Intel and AMD motherboards are spec'd to run 400MHz DDR. The general consensus among memory manufacturers is that 400MHz is the frequency ceiling for DDR, and that if we're to find any more performance, it will be in the DDR2 standard, which permits increased bandwidth, while reducing internal clock speed and voltage. Nonetheless, many memory vendors are selling DDR sticks that claim dizzying speed ceilings of 500MHz and even 533MHz. Are these modules really up to the task?

THE CHALLENGE

We requisitioned 512MB memory sticks from five different vendors, and then ran them at faster and faster speeds to determine their tolerances for error-free operation. To torture the memory good and proper, we used the Ultra-X RSTPro2 PCI RAM tester. The top speed we report is the highest speed at which a module successfully completed five consecutive passes through Ultra-X's stress-test regimen without an error. Our test bed was based on an ASUS P4C800 mobo and an unlocked 3.2GHz Pentium 4. All modules were tested at the most conservative timing settings in single-channel transfer mode, at both 2.65v and 2.85v.

Keep in mind that every stick of memory has its own frequency tolerances. In other words, one stick of Kingston DDR might be more overclocking-friendly than another Kingston stick of exactly the same rating. That said, this Maximum PC Challenge should give you a good idea of the current state of memory affairs.

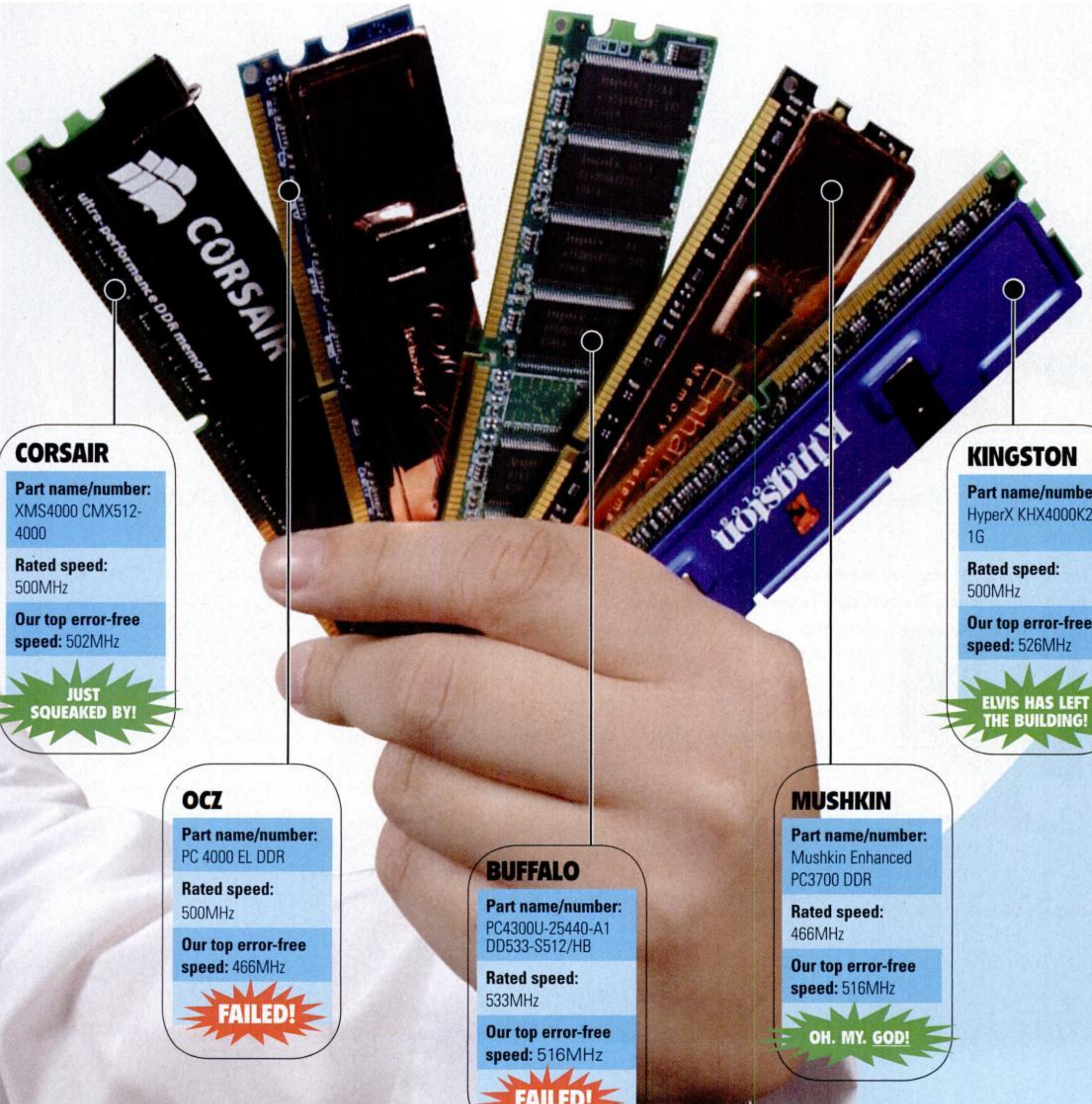
SO WHICH ONES POOPED?

Some of the competitors comfortably exceeded their speed ratings, while others couldn't even run error-free at their *advertised* speeds. It's important to note that all the modules were outfitted with memory chips originally spec'd for DDR400 (400MHz) settings. We should also point out that three of five sticks tested (Buffalo, Corsair, and Mushkin) used the exact same type of Hynix memory chips, but boasted ratings ranging from 466MHz to 533MHz.

Now, you might be asking why all this memory, ostensibly qualified for 400MHz, was rated for so many different speeds. Well, the various memory makers likely speed-test all the sticks they manufacture, and label the faster samples with higher ratings—if not higher prices. There's nothing wrong with this practice, except that there's very little most of us can do to validate the ratings. In fact, all the sticks we tested booted into Windows and ran a number of benchmarks without a hiccup at their claimed speed ratings and faster. Our Ultra-X RAM tester exposed potential flaws that an overclocker might not find when running, say, *Quake III*, but make no mistake: Not all DDR400 memory chips are created equal. Pushing your FSB and memory speed way past 400MHz is a risky proposition. But if you must, we recommend Kingston's HyperX, which uses Samsung chips and successfully ran through our gauntlet of tests at 526MHz before pooping out.

Now does anyone have a recipe for fried RAM?

—DWIGHT LOOI



CORSAIR

Part name/number: XMS4000 CMX512-4000

Rated speed: 500MHz

Our top error-free speed: 502MHz

JUST SQUEAKED BY!

OCZ

Part name/number: PC 4000 EL DDR

Rated speed: 500MHz

Our top error-free speed: 466MHz

FAILED!

BUFFALO

Part name/number: PC4300U-25440-A1 DD533-S512/HB

Rated speed: 533MHz

Our top error-free speed: 516MHz

FAILED!

MUSHKIN

Part name/number: Mushkin Enhanced PC3700 DDR

Rated speed: 466MHz

Our top error-free speed: 516MHz

OH. MY. GOD!

KINGSTON

Part name/number: HyperX KHX4000K2/1G

Rated speed: 500MHz

Our top error-free speed: 526MHz

ELVIS HAS LEFT THE BUILDING!

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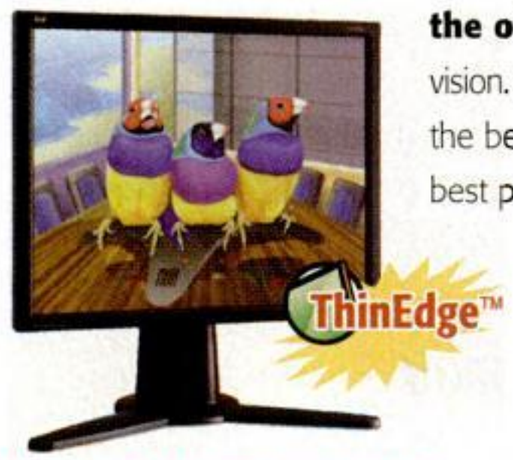

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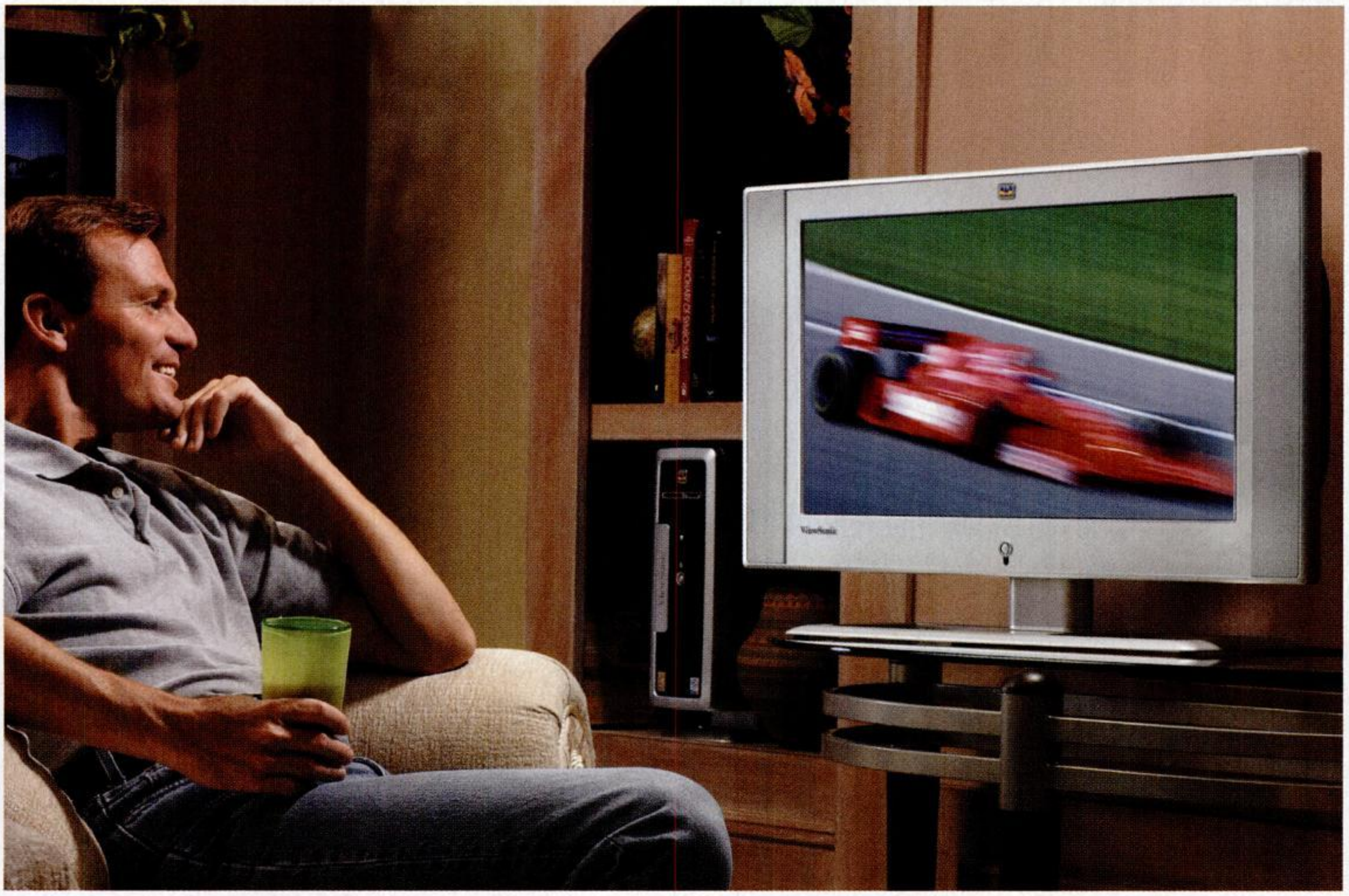

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How To... A step-by-step guide to tweaking your PC Experience

TURN YOUR POCKET PC INTO A Pocket Movie Theater

8 steps to converting your DVDs into video files that'll play on your PDA

MAXIMUM PC
TIME TO COMPLETION
08:40
HOURS MINUTES

BY LOGAN DECKER

Just a few years ago, not even David Copperfield would have dared attempt to squeeze a full-length motion picture into a PDA. But that's exactly what we're going to show you in this month's How-To. We'll take a DVD movie and convert it into a compact video file that will play on your handheld, and look pretty damn good in the process. Don't be put off by the nightmarish 140-step how-tos you may have seen on the web. We've cooked up a simple method that works with all unencrypted DVDs and all Pocket PCs.

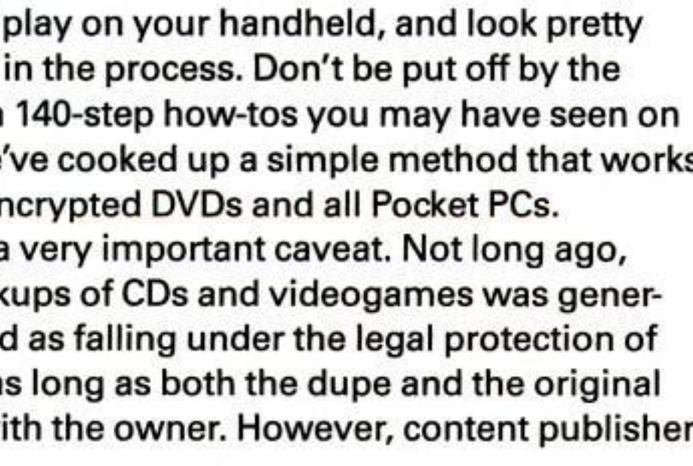
But first, a very important caveat. Not long ago, making backups of CDs and videogames was generally accepted as falling under the legal protection of "Fair Use" as long as both the dupe and the original remained with the owner. However, content publishers weren't required to make the backup process easy, or even possible. Breaking copy-protection schemes in order to create a backup was often a laborious process (when it worked at all), but it was considered legal.

The Digital Millennium Copyright Act (DCMA) changed all that. Making backup copies is still legal, but circumventing built-in copy protections is not. Most commercial DVDs are encrypted with Content Scrambling System (CSS). Although you can find loads of software on the Internet to decrypt DVDs so that they can be copied, doing so is a violation of the law. Keep that in mind.

For this how-to, we're using *The God of Cookery,* a DVD that does not have CSS encryption. And if you think that's odd, you should see the movie.

What You'll Need

- **A Pocket PC running the Windows Mobile 2003 OS (aka Pocket PC 2003)**
- **A Pocket PC-compatible memory card that holds at least 256MB**
- ***DVD2AVI* (http://arbor.ee.ntu.edu.tw/~jackei/dvd2avi)**
- ***TMPGEnc* (trial version at www.pegasys-inc.com)**
- ***Windows Media Encoder* (www.microsoft.com)**



The iPaq 5455's 240x320 screen is perfect for pint-size movie viewing, but first you have to get the movie into a Pocket PC-friendly format.

Step 1: Install the Software and Codec

DVDs store video files in a media compression format called MPEG-2, a relatively efficient format that doesn't sacrifice much visual quality. But in order to squeeze an entire movie down to a reasonable size for a handheld, we need a codec (short for encoder/decoder) that's a little more "aggressive." That's where *Windows Media Series 9* comes in. The codec used in *Windows Media* video is capable of extreme compression ratios. Visual quality takes a hit, of course, but the video degradation is less noticeable on a small Pocket PC screen than on your monitor or television. Plus, you can always experiment later to increase visual quality at the expense of much larger file sizes. If you've got the storage memory to spare in your handheld, go for it.

We're using *Windows Media Encoder* instead of the familiar DivX codec for a number of reasons. *Windows*

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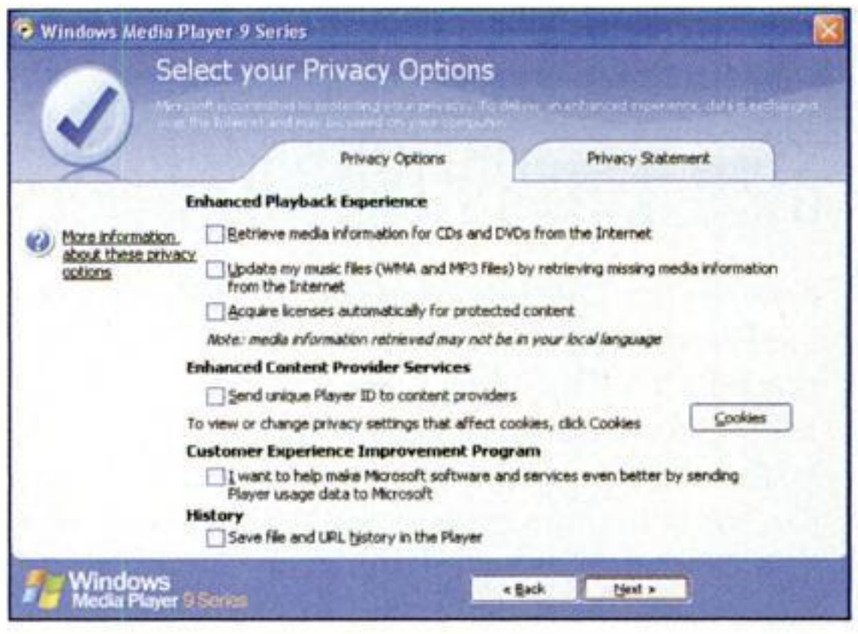
Media Encoder is far easier to use, has convenient options that various DivX front-ends lack (such as the option to set a ceiling on filessizes and let the encoder calculate the maximum bitrate of your file). *Windows Media Encoder* also offers much higher-quality video compared with DivX at equivalent file sizes, and is free. The only catch is that your PDA must be running Windows Mobile 2003—the latest version of the Pocket PC OS. Only Windows Mobile 2003 comes with *Windows Media Player 9*, and you can't install this software onto a handheld with Pocket PC 2002.

Go to you PC, and install *DVD2AVI, TMPGEnc, Windows Media Encoder,* and *Windows Media Player 9*. Ready? Then let's get started.

As long as you're installing *Windows Media Encoder,* you may as well install Microsoft's tarted-up *Windows Media Player 9*. Just don't forget to scrutinize the "Privacy Options" carefully.

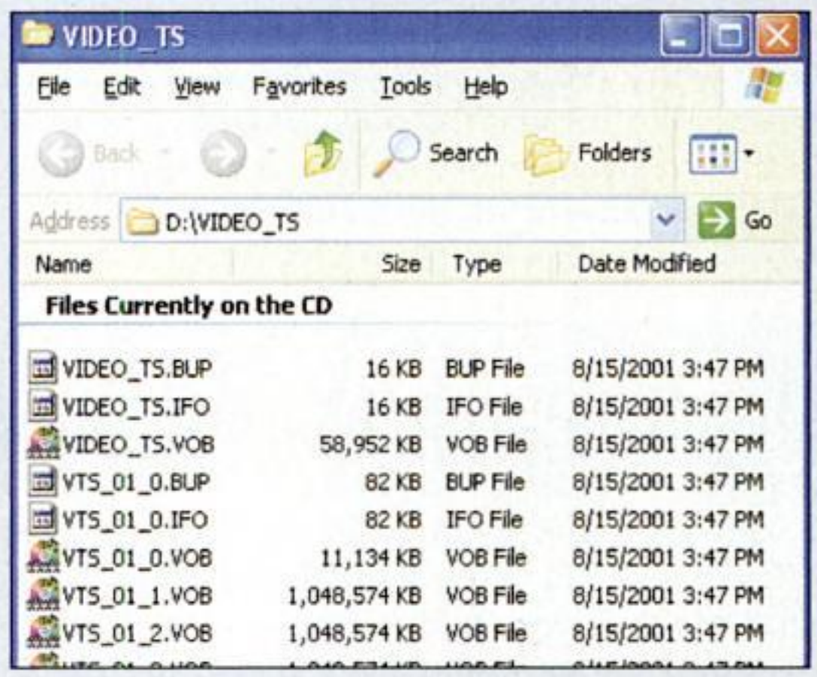


Step 2: Gather Your VOBs

Put the unencrypted DVD that you want to convert into your PC's DVD-ROM and peek at the file structure. You'll see two directories: AUDIO_TS and VIDEO_TS. Ignore AUDIO_TS; it's intended specifically for DVD-Audio discs and doesn't contain the movie's audio information. Now look inside the VIDEO_TS directory, and you should see three kinds of extensions on the files: BUP, IFO, and VOB. The IFO files contain menu and other disc content information. The BUP files are backups of the IFO files. As you'll probably figure out from the file sizes, it's the VOB files that hold the goods.

In fact, VOB files are really just MPEG-2 files with a little extra information in them (info about alternate angles, etc.). Each VOB contains several chapters of the DVD. Our goal is to take these VOB files and turn them into a single AVI for compression later. We're going to start this process with *DVD2AVI*.

But before you can do that, you need to drag and drop the contents of your DVD's VIDEO_TS directory to your desktop.

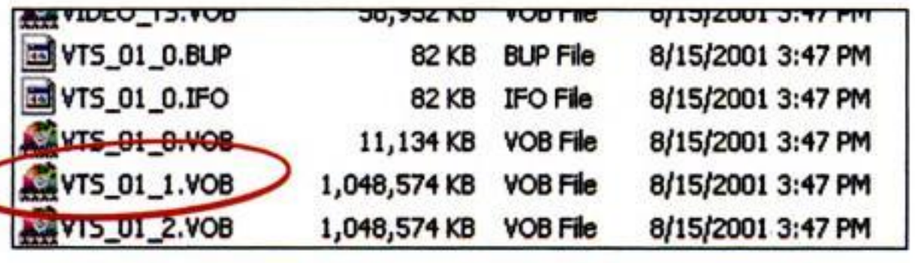


Here are the contents of a typical VIDEO_TS directory. The AUDIO_TS directory can be ignored; it's only for DVD Audio, which no one we know is listening to yet.

Step 3: Find the Main VOB File

Actual movie files aren't the only things saved as VOB files. Menu animations and tedious stuff like that are also saved as VOB files, and you won't want to convert them. So the point of this step is to locate the very first VOB file that's part of the actual movie. Doing this is easy. The file you need will be the first huge file in your file list.

You can drop this file into your DVD playback software to verify it's the beginning of your movie. Just don't use *Windows Media Player 9* to test out the VOB file. Although the prior version, *Windows Media Player 8*, would play VOB files as long as you had a software DVD player installed on your PC, this doesn't work in the new version.



The actual movie content begins with the really large VOB files. Generally, they are just over 1GB in length, as shown here.

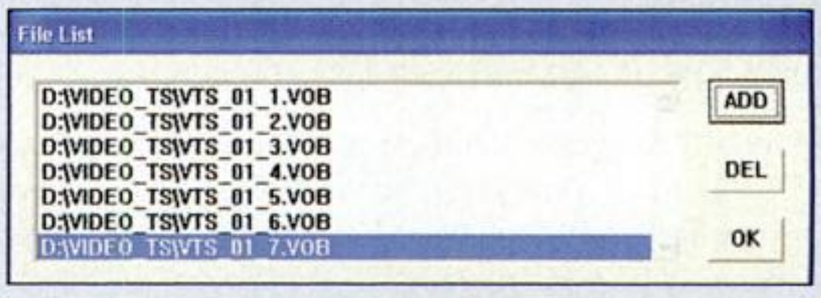
Step 4: Convert VOB files w/DVD2AVI

DVD2AVI, strangely enough, doesn't create playable AVI files. But we will use it to convert the audio and video in VOB files into a format that *Windows Media Encoder* can handle in the next step.

So launch *DVD2AVI,* and select Open from the File menu. This next part is rather cool—all you have to do is point *DVD2AVI* to the first large VOB file that you picked out in the previous step, and it will automatically locate and add the remaining VOB files for the movie.

From the menu, go to Audio > Dolby Digital Decode, and select Dolby Surround Downmix to reduce 5.1 surround sound to the two-channel output your Pocket PC will expect. Under the same menu, click on "48 -> 44.1KHz" and choose Low. Pocket PCs will only play audio sampled at 44.1kHz or lower, and the Low option encodes faster than the others, with virtually no difference in sound quality (at least on a PDA!).

Now go to File > Save Project. Do not select "Save AVI." Give the project a name and location, and it will be saved as a file with the D2V extension. It might take a while, but the "Remaining Time" in the encoding window is pretty accurate.



Point *DVD2AVI* to the first VOB file that contains actual movie content, and it will automatically select all the remaining files for you.

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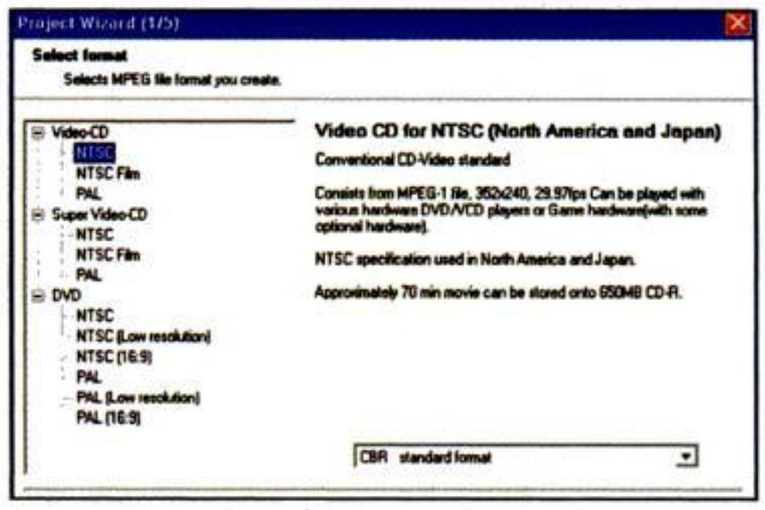
Step 5: Import the D2V Project into TMPGEnc

Now fire up *TMPGEnc*. You should see the Project Wizard pop up. If not, just press Ctrl-W. You'll see a menu that says "Select format." Choose "Video CD NTSC." Choosing any other format will just result in more transcoded information than your Pocket PC will use. Click Next.

Now you'll see a menu called "Select source file." Click the Browse button next to "Video File" and select your file. Don't worry about "Audio File" because the D2V file includes the audio as well. Click Next through the following menus (which are advanced options not really necessary for Pocket PC viewing) until you get to the menu with the OK button. Click on OK to begin encoding.

Encoding can take a long time—a *really* long time if you have slow hardware. What you see in the "Remaining time" in *TMPGEnc* is usually optimistic, so assume a 33 percent longer wait time than what initially appears in this area. Go do something interesting, and if you're encoding overnight, you can check the box in the encoding window at any time to ask *TMPGEnc* to shut down your PC when it's finished with the job.



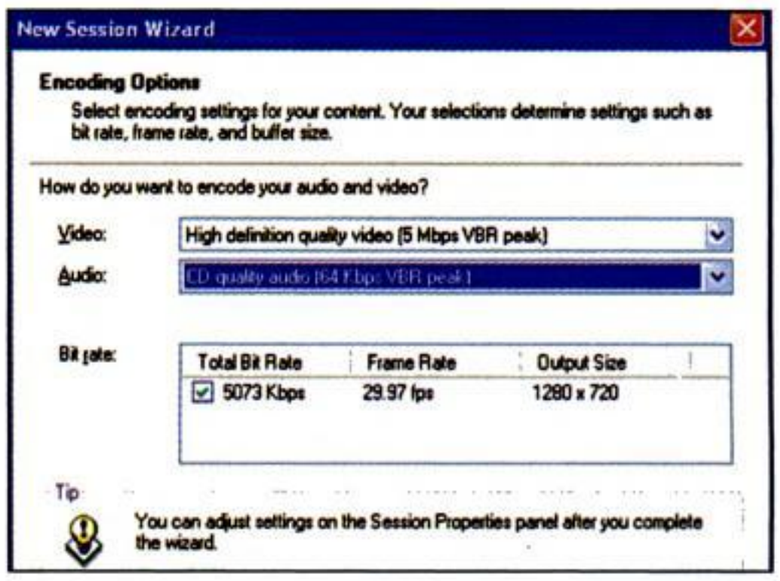
We're choosing the relatively low-bitrate Video CD format to begin with. Don't panic, because the Video CD format still creates higher-quality media than your handheld can actually render.

Step 6: Put the Squeeze on Your Video with WME

OK, almost done. What we've got from *TMPGEnc* is a file in the standard MPEG-1 format. Now we need to apply some heavy-duty compression using *Windows Media Encoder*.

Start up *WME*, and you'll immediately see a wizard. Select "Convert a file" and click OK. Under the "Source file" dialog, browse to the MPG file that you got from *TMPGEnc*. By default, WME will dump its completed WMV file into the same directory, but feel free to click "Browse" to change the name or location if you want. You shouldn't mess with the extension, though.

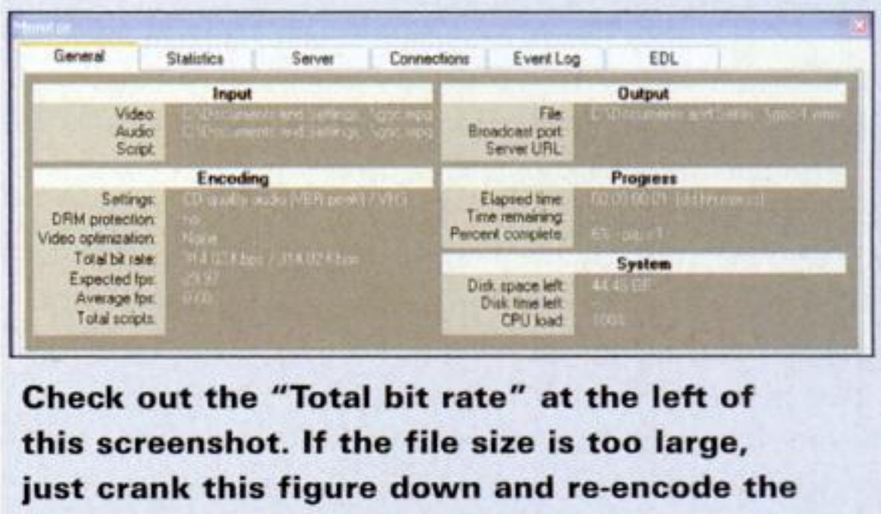
Click Next, and you'll see a dialog that asks, "How do you want to distribute your content?" Select "Hardware devices" and click Next. Leave "Video" alone for now, but use the drop-down list to change audio to CD quality (you could opt for a higher bitrate, but that would be overkill, in our opinion). Ignore the other settings. Click Next and add title and artist information in the next screen before you click Next again. Before you press Finish, uncheck "Begin converting when I click Finish." Now click Finish.



At this point, just select CD Audio in the Audio drop-down box. We're going to tweak the Video settings on our own in a later step.

Step 7: Customize the File for Your PDA

At the top of the screen, you should see a button for Properties. Click it, and select the Output tab. Here's where we're going to tailor our video specifically for Pocket PC. Our recommended settings are "VHS quality video" and "CD quality audio." This results in a file size of 205MB for a 1:28 (hr:min) video. You can experiment with your own manual settings later by accessing the other tabs ("Video Size" and "Advanced"), but these settings will get you started. Click Apply, then hit the "Start Encoding" button at the top. Again, this could take a while.



Check out the "Total bit rate" at the left of this screenshot. If the file size is too large, just crank this figure down and re-encode the movie (from the original MPEG file).

Step 8: Copy Your Movie to Your Handheld

The result? We got a 4.7GB movie file down to 205MB, at 30 frames per second! If your memory card isn't big enough to hold a file this size, you can always tell *Windows Media Encoder* how much space you do have and let it determine the compression settings for you. Click the Properties button, select the Output tab, check "Encode to file," check "Limit by size," and enter the maximum size you want the video to be. Click Apply, and then hit the "Start Encoding" button.

The resulting WMV can be copied directly to your PDA's memory, anywhere you want. Double-click the file, and it will automatically launch in *Windows Media Player 9 Series for Pocket PC*. For the best image, we strongly recommend that you set *Windows Media Player* to play your movie in Landscape mode. Open the player, go to the Tools menu, click Settings, select "Audio and Video," and check the box that says "Rotate 180 degrees in full screen." ■

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In the Lab

A behind-the-scenes look at Maximum PC testing

On the Brink of Benchmark Bliss

It's almost time for new system tests! Here's what we've got cooking up...

***Premiere Pro 7.0* doesn't just look different, it's also been renovated from top to bottom, and offers better multi-processing and Hyper-Threading support.**

Next month, we'll be updating the benchmarks we use in system and notebook reviews to reflect changes to the always-improving PC platform. We know, we know: The new benchmarks are long overdue. We would have updated them sooner, but we've been waiting patiently for a new version of *SYSmark*, as well as a pixel and vertex shader test based on a real-world triple-A title.

What exactly goes into our benchmark selection process, you ask? This month, we thought we'd give you a peek inside our minds. Our current suite consists of *SYSmark2002*, *MusicMatch 7*, *Premiere 6.01*, *AudioGrabber*, and *3DMark2001 SE*. These tests were fine when we picked them, but now newer software and tests are available.

One of the most helpful benchmarks has been BAPCo's *SYSmark*. This benchmarking suite uses real-world office and content creation apps to determine a machine's overall performance. In the past, we've found that increases to CPU speed, L2 cache size, bus speed, main system memory amount, and even hard drive speed can be exposed by *SYSmark*. AMD, however, dropped a massive stink bomb when *SYSmark2002* was released, arguing that some specific workloads in the benchmark unfairly favor the Intel Pentium 4. Luckily for all, *SYSmark2004*, which is expected to be available next month, was designed with the blessings of both Intel and AMD, so it will be difficult for either chip company to gripe.

For *SYSmark2004*, the developer (BAPCo) will add Adobe's *After Effects* and *Acrobat*, and Discreet's *3ds max* to the mix. Also, to properly reflect what real people use today, BAPCo will ditch Netscape *Navigator* for *Internet Explorer 6*. This brings the suite's total number of applications to 17. We've used *SYSmark* as a benchmark since *SYSmark95*, and we're glad to see that AMD is now fully onboard.

In casting about for a programmable shader gaming benchmark to replace the aged *3DMark2001* Game 4, we're looking with googly-eyes at Valve's *Half-Life 2* for a number of reasons. First, it'll likely be the biggest PC game this year (if not the last three years), so gamers will definitely want to know which systems and videocards best handle it. Second, the game should be a brutal challenge to a videocard's shaders, and this will give the test longevity. Third, it's a real-world game. *3DMark* uses a legitimate 3D engine, but it's not based on a real-world game. Some videocard and system vendors may complain that *Half-Life 2* isn't a purely representative test, but if the game is as popular as we expect it to be, we figure hardware better run it quickly.

We'll also probably pick a backup game benchmark that is much less dependent on shader performance. This benchmark could end up being one of the test runs in *3DMark2003*, or maybe *Unreal Tournament 2003's* flyby test. We'd ultimately like a gaming benchmark that scales well with CPU, memory, and videocard performance, but we haven't yet found the perfect candidate.

For MP3 encoding (which heavily taxes a system's CPU), well probably stick with *MusicMatch*. We originally picked this app because of its widespread use among readers, its good encoding quality, and because it allows us to set the processing level of an MP3 file. We also plan to keep our *Premiere* video encoding and editing test, but we'll upgrade to *Premiere Pro 7* (the "pro" tag is just a new Adobe naming convention; the new software is the natural successor to *Premiere 6.5*). We know full well that this switch will suddenly favor the Pentium 4 over the various AMD CPUs—thus reversing AMD's long-standing stranglehold on the benchmark—but we'd be remiss if we continued to use old, outdated software. New hardware exists to run the latest software as quickly as possible.

Besides updating system benchmarks, we're also preparing to revamp the baseline machines ("test beds") that we use for individual component testing. The big question is, Pentium 4 or Athlon 64 FX? If we go P4, we'll be assured that all our test beds will be running a robust and well-supported motherboard infrastructure. If we select 64 FX, we'll probably be running the overall fastest system available (we write "probably" because we haven't yet tested the Pentium 4 Extreme Edition; see sidebar on page 62 for details).

Check back next month for our full benchmarking disclosure.

***MusicMatch 8* gives the user an incredible amount of control over how MP3s are encoded, and will probably be included in our next benchmarking suite.**

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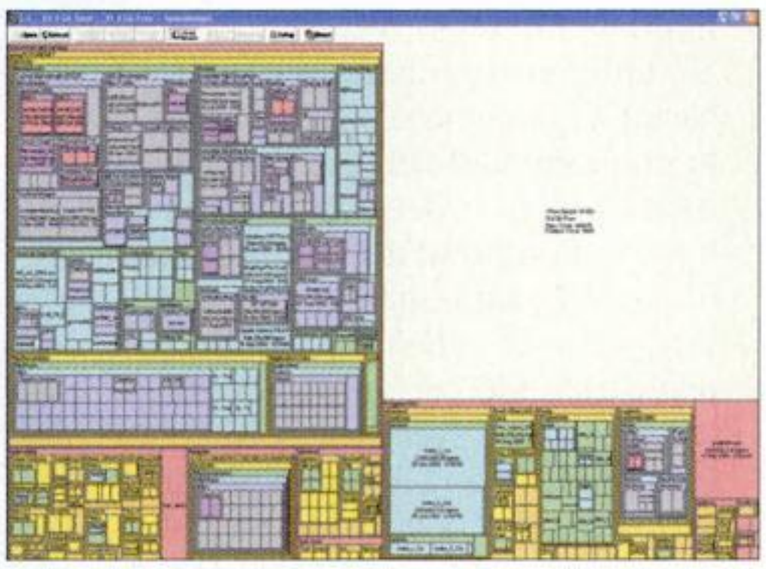
TESTED & GEEK DISAPPROVED

Kensington's Wi-Fi Finder

For all the 10-year-olds who furtively searched their backyards for Skylab parts with a surplus Civil Defense Geiger counter in the 1970s, Kensington offers the Wi-Fi Finder. Despite claims that it can detect 802.11b signals as far away as 200 feet—all while filtering out 2.4GHz phones, microwaves, and Bluetooth devices—the Wi-Fi Finder is stunningly bad. In our office (which has enough 2.4GHz energy to cook a bird in mid-air), the finder sometimes finds our network and sometimes doesn't. Worse yet, during real-world testing, we found that it actually detected our turkey pot pies in the mic'er despite claims that it wouldn't. Seriously, folks, a number of people in our publishing company have tested the Wi-Fi Finder, and we've never reached such unanimous consensus: The thing just doesn't work. $25, **www.kensington.com**

SpaceMonger: Our New Favorite Utility



Pictured is a to-scale inventory of the various files on a hard drive. The large area on the right is empty disk space.

There's probably no listing in the *Diagnostic and Statistical Manual of Mental Disorders* for people who hoard data like pack rats, but the little freeware app *SpaceMonger* can probably tell you if you have a problem. Designed to display the data in your hard drive using a technique called Treemaps, it vividly illustrates just how much crapola you've collected. The screenshot pretty much tells the whole story, but we should note that everything is rendered to scale. You can also easily drill down into folders to delete files if that's your desire. The 1.4 version is freeware, but the developer says he will have to charge $20 for the new 2.1 version. Go to **www.werkema.com** for details.

Best of the Best

As of November, 2003

For a second straight month, we see little movement in our most-favored hardware list—save for one gigantic, glaring change: We've bumped nVidia's GeForce FX 5900 Ultra from the high-end videocard slot because of possible issues with *Half Life 2*. It really comes down to this: ATI's high-end part definitely plays the most anticipated game of the year without problems, but we don't have the same confidence in nVidia's best card. See our Quick Start section for details.

High-end videocard:
ATI Radeon 9800 Pro 256

Budget videocard:
ATI Radeon 9600 Pro

Do-everything videocard:
All-in-Wonder Radeon 9800 Pro

Soundcard:
Sound Blaster Audigy 2 Platinum

Serial ATA hard drive:
Western Digital 360GD Raptor

Parallel ATA hard drive:
Western Digital WD2500JB

CD-RW drive:
Plextor PlexWriter Premium

DVD burner:
Pioneer DVR-A06

LCD monitor:
Sharp LL-1820

High-end CRT monitor:
Sony F520

Budget CRT monitor:
Cornerstone P1750

P4 motherboard:
Intel D875PBZ

Athlon XP motherboard:
Asus A7N8X Deluxe Rev 2

Portable MP3 player:
iPod 30GB

Photo printer:
Epson Stylus Photo 1280

Pocket PC PDA:
HP iPaq 5450

Palm OS PDA:
Palm Tungsten C

5.1 speakers:
Logitech Z-680

4.1 speakers:
Logitech Z-560

2.1 speakers:
Klipsch Promedia 2.1

What we're currently playing: *Star Trek: Elite Force II, Call of Duty Demo, Battlefield 1942: Secret Weapons of WWII, Chaser.*

Have You Seen Our Missing Predicates?

We won't try to sugarcoat this: The magazine has had a rash of "missing word" problems lately. The gaffes usually occur in an article's final paragraph—the text just drops off into nothingness. Should we blame human error or the page layout software we use? After all, we did just switch from Quark *Xpress* to Adobe *InDesign*. Let's investigate, and see if we can't find the wily words.

MISSING: The final sentence of Tom McDonald's September Game Theory column. A business sim designed by whom, you ask? Perhaps some day the missing words will appear.

MISSING: The final words of our October issue Rig of the Month contest instruction teaser. See previous page for what, exactly?

MISSING: The final words of this particular photo funny column. Boy oh boy, if Old Man Phillips catches wind of this, he'll

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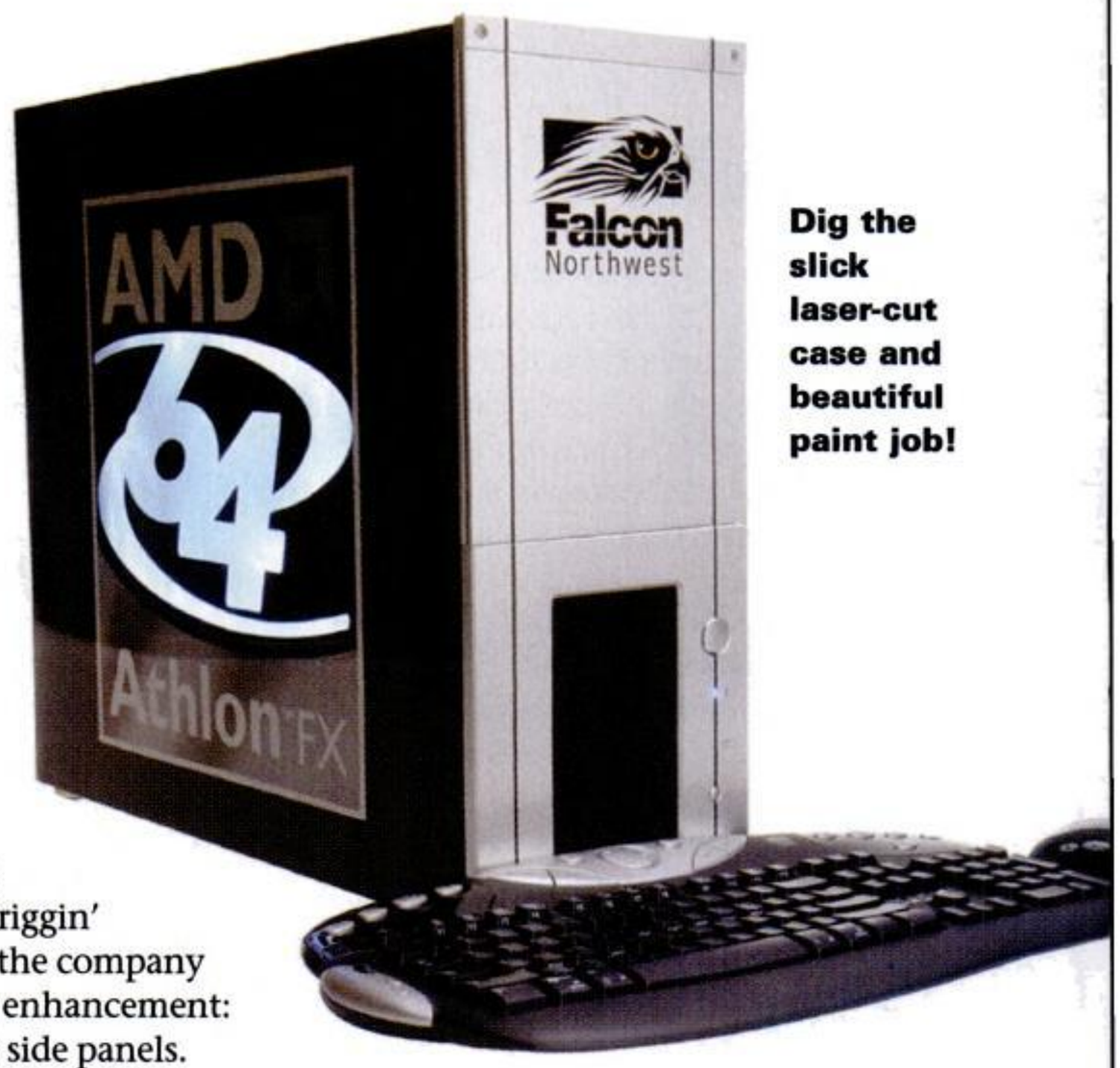
Falcon Northwest Mach V FX-51

Once again, Falcon is our chaperone to the new hardware party



Dig the slick laser-cut case and beautiful paint job!

These days, it seems like every system vendor—big, small, seasoned, or green—wants to cast itself as a manufacturer of elite gaming PCs. But slapping the fastest CPU into an aluminum case with a neon light isn't all it takes.

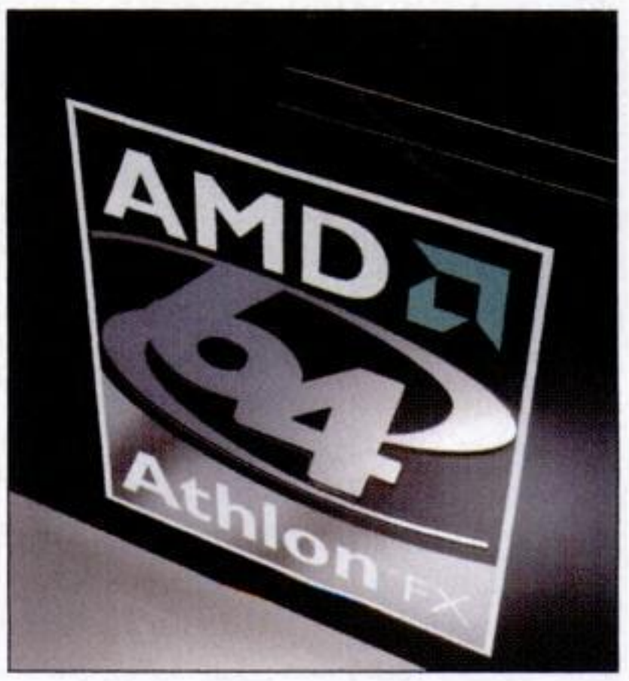
No one knows that more than Falcon Northwest, which arguably pioneered the gaming PC genre more than a decade ago. Maybe longevity and experience *do* count for beans, because Falcon's latest Mach V wowed us with an array of firsts in all the right categories: (1) The company's latest flagship box has AMD's Athlon 64 FX-51 processor, which is seemingly built just to play games. (2) The Mach V is armed with a speed-bumped nVidia GeForce FX 5950 Ultra (emphasis on "50," kiddies). (3) The rig includes the new Plextor combo drive that's capable of burning DVDs at 8x *and* CD-Rs at 40x. There's also a set of Klipsch Ultra 5.1 speakers.

Falcon already has a rep for offering the best paint jobs in the business—we're talking custom-painted and decaled makeovers that will blow your friggin' mind. But now the company is adding a new enhancement: backlit laser-cut side panels. Falcon went with an AMD fanboy theme for our review rig, and we have to admit that the 40-plus ultra-bright LEDs illuminating the "64" logo is a sight to behold. But the really trick part becomes apparent when you turn everything off: Instead of looking like clear plastic, the 64 symbol looks chromed. It's an elegant, understated effect, if not the aesthetic opposite of the in-your-face, wide-open case windows that will inevitably make many PCs look dated by next year.

The rest of the rig's load-out is top-rate. How does a Sound Blaster Audigy 2 and a pair of 10,000rpm Western Digital Raptor drives in RAID 0 suit you? Though fast, the 36GB Raptors don't pack quite enough storage for modern PCs. Falcon probably intentionally left the machine without more bulk storage because it's marketed as a gaming box, but we'd have to say that this otherwise perfect PC could use more gigabytes.

Performance-wise, the Mach V scoots along at supersonic speeds, though not all of the Falcon's performance is exposed by our stock system review benchmarks. While the Falcon turned in the fastest recorded *SYSmark2002* score for an AMD-based box, we've seen faster from RAIDed Pentium 4 machines. (AMD says that *SYSmark2002* still favors Intel silicon; hopefully the imminent release of *SYSmark2004* will squelch the squawking.) In *Premiere*, essentially a video-encoding and editing test, Polywell's Opteron system didn't fare so well, but at 2.2GHz, the A64FX made short work of the test, and 3.2GHz P4 systems as well.

The new Mach V did run into problems with *3DMark2001's* Game 4. Just two months ago, this DirectX 8.1 benchmark was cranking out 90-plus frames per second when running on nVidia Ultra 5900 cards. So why did



The laser-cut logo looks like a mirrored surface when the rig is powered off, though this picture doesn't do the effect justice.

UNDER THE HOOD

THE BRAINS	
CPU	AMD Athlon 64 FX-51 (2.2GHz)
Mobo	Asus SK8N (nForce3 Pro chipset)
RAM	1GB Registered DDR400 Legacy Electronics (two 512MB sticks)
I/O ports	Six High-Speed USB 2.0, one serial, one parallel, two FireWire
LAN	nVidia Fast Ethernet (integrated)
DISPLAY	
Videocard	nVidia GeForce FX 5950 Ultra (579MHz core, 475MHz DDR)
STORAGE	
Hard drives	Two 36GB Western Digital WD360GD (10,000rpm SATA, 8MB cache), integrated Promise RAID chip
Optical	Toshiba DVD-ROM SD-M1712 16x DVD-ROM / Plextor DVD PX-708A (8x DVD+R, 4x DVD-R, 40x CDR)
AUDIO	
Soundcard	Sound Blaster Audigy 2
Speakers	Klipsch ProMedia Ultra 5.1
FINE DETAILS	
Case	CoolerMaster ATC110, Enermax 460-watt power supply, custom paint job, laser-cut & mirrored Athlon 64 FX-51 logo, LED back-lighting
Fans/extras	Four 80mm case fans, Zalman CPU fan
Mouse	Logitech MX 700 Cordless
Keyboard	Logitech Elite Keyboard Cordless
BUNDLE	
Windows XP Home, CyberLink PowerDVD, Easy CD Creator 6	
BOOT: 50 sec.	**DOWN: 8 sec.**

Our zero-point system includes: an Intel D850MV motherboard, a 2GHz P4 CPU, 512MB PC800 RDRAM, a GeForce4 Ti 4600 videocard, and a Western Digital 1000BB hard drive (2MB cache).

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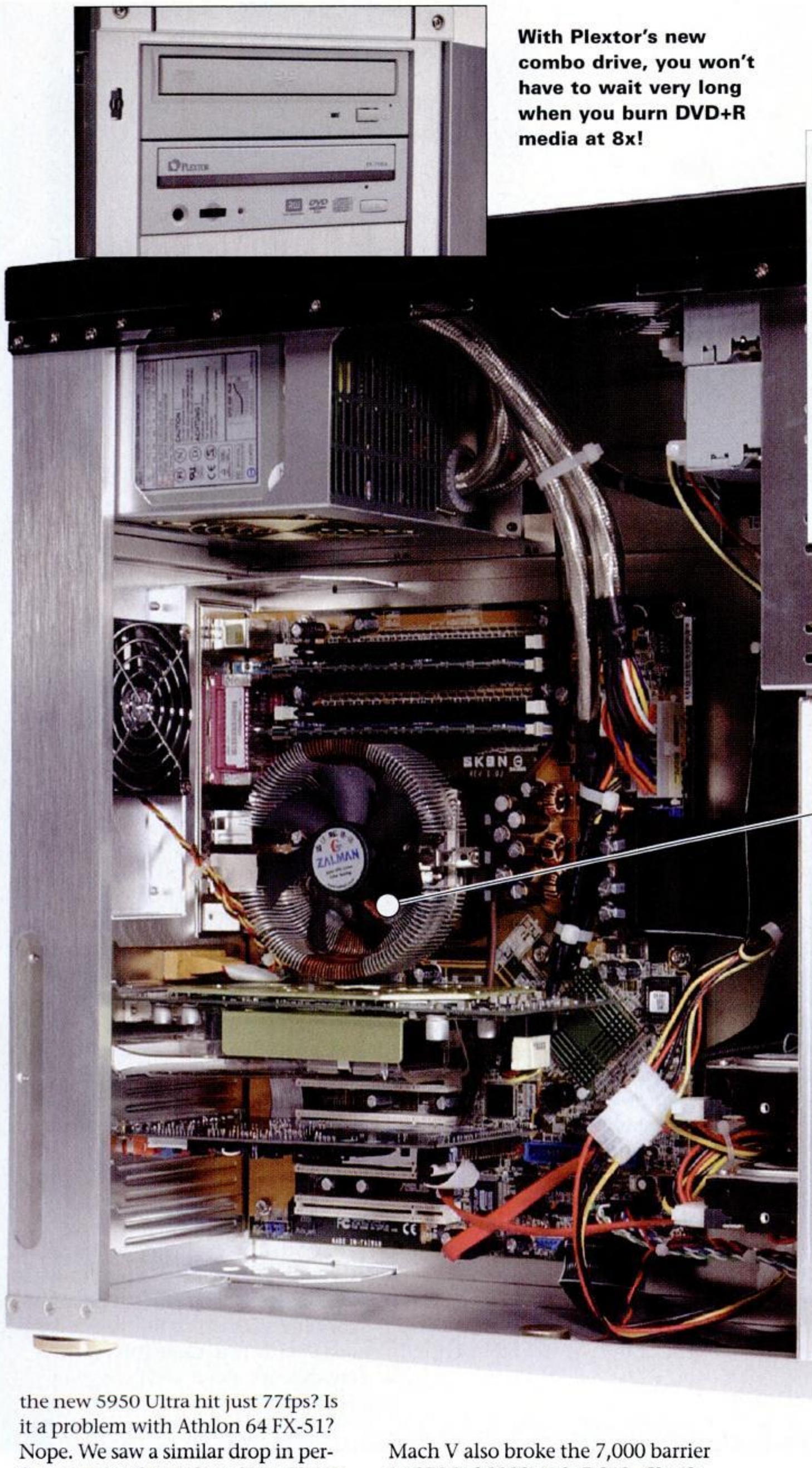

With Plextor's new combo drive, you won't have to wait very long when you burn DVD+R media at 8x!

The Klipsch ProMedia Ultra 5.1s update an old classic with a new control pod and subwoofer.

The Athlon 64 FX-51 seems to have been expressly designed for gameplay—perhaps the integrated, full-speed memory provides the secret turbo boost.

the new 5950 Ultra hit just 77fps? Is it a problem with Athlon 64 FX-51? Nope. We saw a similar drop in performance in the P4-based MaxVision system, which was running a 5900 Ultra and should have been in the 90-plus frame rate range as well. We suspect some new driver tweak is responsible for the drop in Game 4.

But the Falcon kicked ass in its overall *3DMark2001* score, blasting out 20,687, something we couldn't break with our own hand-built Dream Machine 2003 and its highly overclocked 5900 Ultra. The Falcon Mach V also broke the 7,000 barrier in *3DMark2003* with 7,213. Check out this month's Athlon 64 FX-51 feature for more information on the CPU's prowess as a gaming chip.

Once again, Falcon awed us with hot-off-the-fab hardware. Other system vendors promised us an embarrassment of riches this month, but couldn't deliver. It looks like 10 years experience building gaming PCs *does* have its advantages.

—GORDON MAH UNG

MAXIMUM PC VERDICT 9

+ THE FALCON

An Athlon 64 FX-51, GeForce FX 5950 Ultra, and 8x Plextor drive make the new Mach V a technology showcase.

– THE SNOWMAN

The machine could use much more bulk storage for multimedia sundries.

$5,046 ($4,651 w/o speakers) www.falcon-nw.com

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MaxVision MaxPac

The "portable desktop" concept taken to extremes

The MaxPac is the first briefcase-computer hybrid we've seen.

Shuttle may have been the first company to target the portable desktop market, but if you're thinking about building your own bare-bones Shuttle mini-system for use as a LAN party rig or portable workstation, MaxVision would like you to reconsider. The MaxVision MaxPac is an innovative one-piece PC that folds up into a briefcase for easy transport, yet still manages to deliver all the power—and even some of the upgradeability—of a full-size desktop machine.

Picture yourself strolling into a LAN party alongside all the chumps lugging their 50-pound towers and CRTs, and calmly placing your MaxPac on the table. "Whatcha got in that briefcase—a laptop?," a fellow gamer sneers. Rather than dignifying his jibe with a response, you remove one side of the "briefcase," revealing a 17-inch LCD screen that's attached to a blazing 3.2GHz gaming rig. Chaos ensues as everyone swarms to check out your swank rig.

OK, this scenario might be a stretch of the imagination. But if it should happen, you won't lose any face when the MaxPac needs to prove itself in the performance department. This system packs a full complement of top-end components: Intel's fastest Pentium 4 processor, a gig of memory, a 256MB GeForce FX 5900 Ultra videocard, and even two 120GB hard drives striped in a RAID array. All of these elite components are plugged into a custom ATX motherboard, and can, in theory, be upgraded.

We're impressed that MaxVision managed to cram so much goodness into such a small space, but we take issue with several configuration choices. The motherboard sports Intel's budget 865G chipset rather than the performance-oriented 875, and even worse, MaxVision configured our test system with slow DDR333 memory instead of DDR400. As a result, the MaxPac lagged behind otherwise-similar systems in our benchmarks. Take *SYSmark2002:* The MaxPac's score of 310 is respectable, but pales in comparison with the 330 achieved by the non-RAIDed CyberPower system we reviewed in September. The MaxPac posted an abnormally low score in *3DMark2001* SE as well, but this is probably due to a recent nVidia driver update that would seem to be crippling Game 4 performance.

Because the GeForce FX videocard blocks the MaxPac's only PCI slot, MaxVision was forced to use the motherboard's subpar integrated sound. Frankly, we'd rather have a Radeon 9800 Pro in conjunction with an Audigy 2—the improved sound quality would be more than worth the slightly lower 3D performance. The MaxPac's integrated speakers also troubled us. They boast tinnier sound and a lower maximum volume than most *laptop* speakers!

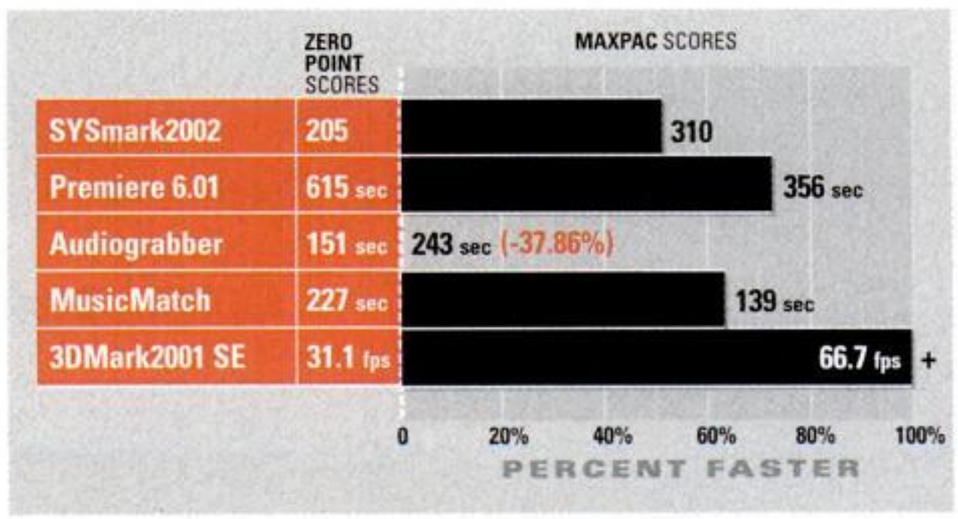
The MaxPac's cooling system is poorly designed, too, putting out more noise than an oscillating desk fan at full blast. And for some reason, its fans are aimed at the front of the case rather than the back, so your face will be treated to a constant blast of warm air during intense gaming sessions.

Despite all its foibles, we'll be the first to admit that MaxVision has come up with a truly pioneering design that scores major points on slickness alone. Hell, it even comes in shock-resistant casing. If price is a concern, stick with a full-size desktop or a Shuttle box, cause this machine is expensive. But if you need a portable workstation or LAN party powerhouse and have deep pockets, give the MaxPac a look.

—OMEED CHANDRA

UNDER THE HOOD

THE BRAINS	
CPU	Intel 3.2GHz Pentium 4C
Mobo	AOpen AX4SG MAX (800MHz bus)
RAM	1GB DDR333 SDRAM
I/O ports	Four USB 2.0, one external FireWire, parallel, serial
LAN	Onboard Gigabit Ethernet
DISPLAY	
Videocard	PNY Verto GeForce FX 5900 Ultra 256MB
Display	Integrated 17-inch 1280x1024 LCD
STORAGE	
Hard drives	Two 120GB WD Raptors (7200rpm, 8MB cache) in RAID 0
DVD/CD-RW	Slim DVD/CD-RW combo drive, 24x12x24x8
AUDIO	
Soundcard	Integrated ALC650 Dolby 5.1 audio
Speakers	Integrated generic stereo speakers
FINE DETAILS	
Mouse	Logitech optical wheel mouse
Keyboard	MaxVision basic black keyboard
BUNDLE	
Windows XP Professional	
BOOT: 57 sec.	**DOWN: 8 sec.**



Our zero-point system includes: an Intel D850MV motherboard, a 2GHz P4 CPU, 512MB PC800 RDRAM, a GeForce4 Ti 4600 videocard, and a Western Digital 1000BB hard drive (2MB cache).

MAXIMUM PC VERDICT 7

HOUSE PARTIES

Slick concept, packed with high-end parts, (somewhat) upgradeable.

STUDY PARTIES

Poor cooling design, mediocre sound and speakers, inferior 865 chipset and DDR333 memory, and pricey.

$5,420 (with built-in monitor and speakers), www.maxvision.com

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- PCupgrade Magazine Oct 2003

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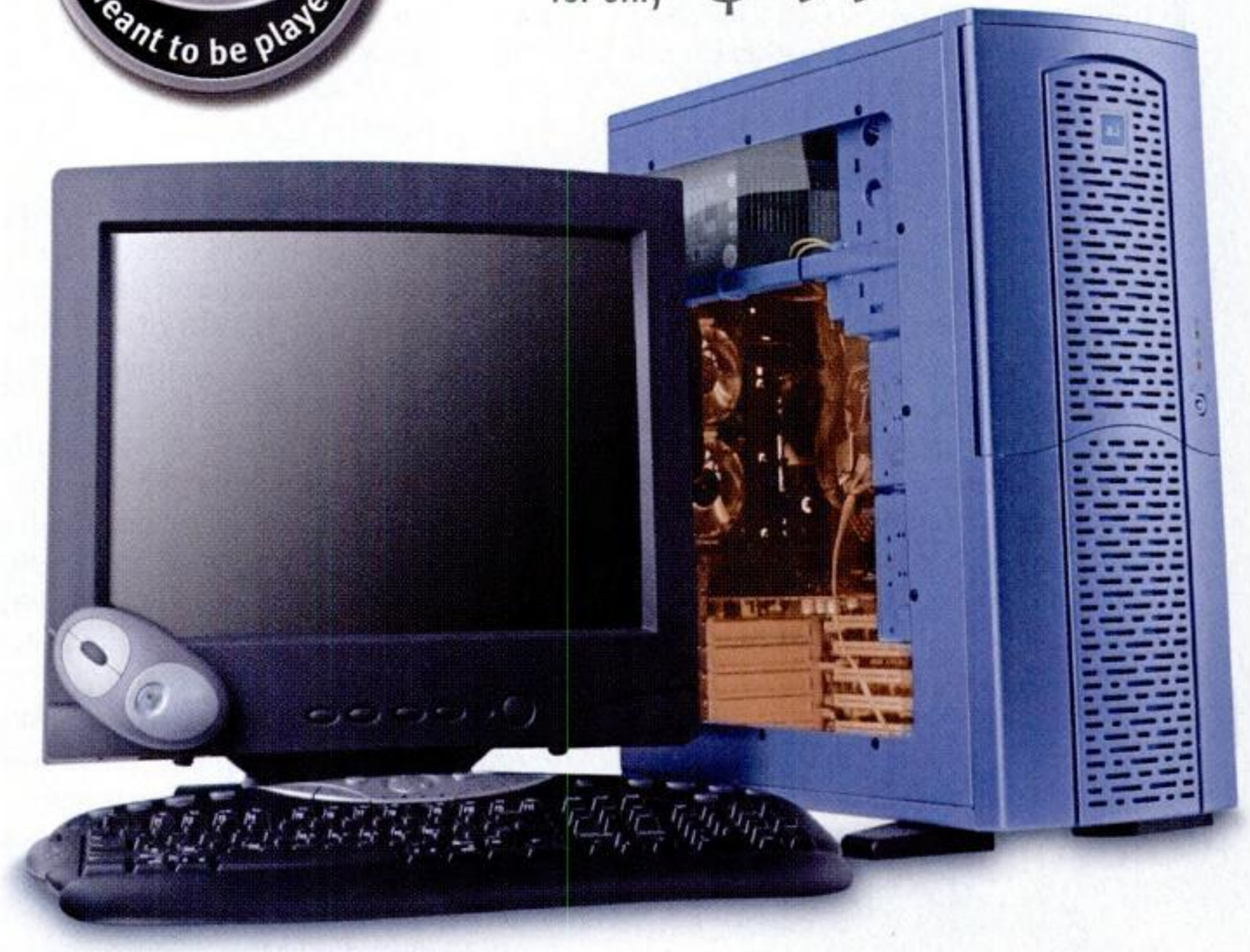

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Videocard Vivisection

Asus and Gainward duke it out with a pair of GeForce FXes

Although it's smaller than the default nVidia cooler, the Asus 5900 Ultra board's copper heatsink still takes up two slots.

If you're buying a gaming videocard right now you have to decide whose chipset to buy, nVidia's or ATI's. The choice is fraught with peril, because you're buying a videocard not only for games you play now, but for the games you'll play in the future, such as *Half-Life 2* and *Doom3*.

This month we test two new cards using the GeForce FX 5900 chipset—the Asus V9950 Ultra and the Gainward PowerPack! Ultra/1200XP 128MB Golden Sample—to see what's doing in the nVidia camp.

The Asus board sports the stock core and memory configs for 5900 Ultra boards. The NV35 core runs at 450MHz, and the card sports 256MB of 425MHz DDR SDRAM. On the other hand, the Gainward GeForce's core is only clocked at 300MHz, but the memory is clocked at 425MHz.

We expected the Golden Sample's slower core to retard performance by as much as 33 percent in our shader benchmarks (*Splinter Cell* and *3DMark 2003* Game 4), but that didn't happen. Instead we saw the Gainward board performing 10 percent slower in most of our benchmarks. *Quake3* was the notable exception. Because it's no longer memory limited, and can't fill the 128MB of RAM on even the Gainward, its scores lined up with our expectations.

Both of the FX 5900 boards perform well enough for you to play today's games at high resolution, but the real question is how they'll perform when playing the huge next-gen titles that will really stress programmable pixel shaders. The answer is: We're not sure.

If you keep up with hardware web sites, you know there's been a huge brouhaha raging over *Half-Life 2's* performance on nVidia hardware. (Check page 11 for the full story). The evidence presented by the *Half-Life 2* developers and ATI is definitely concerning. However, we are withholding our judgment concerning *Half-Life 2* and nVidia cards until we've tested the game on both nVidia and ATI hardware—under conditions we set, and with drivers that are optimized for the game. For the record, this review uses the latest drivers available on nVidia's web site, the 45.23s.

We're sure that nVidia will release updated drivers that will make the NV35-class cards run *Half-Life 2* at a playable frame rate, but we don't know if the game will then run at the same high level of visual detail that ATI cards manage. If you're planning to purchase an nVidia-based board, like the two pictured here, we recommend you hold off until the end of September, when the *Half-Life 2* benchmark will be available to reviewers in completely free testing environments.

The last important thing to note is that neither of these boards actually use nVidia's stock cooler, which takes up two slots. The Asus board uses a heavy copper cooler, with two fans. It still takes up two slots, but it doesn't encroach as far into the second slot as the nVidia cooler (though it does run at about the same sound volume).

The Gainward fan is definitely unique. It also has a two-fan design, but uses an aluminum heatsink instead of copper, and runs quieter than the stock nVidia cooler. What's more, it ships with several blue-white LEDs on the heatsink, giving the installed board an otherworldly glow. Unnecessary? Yes. Cool? Definitely.

—WILL SMITH

Asus 5900 Ultra

MAXIMUM PC VERDICT 7

+ HIPPOPOTAMUSES

Great performance in today's games, and a smaller, quieter heatsink.

– GOATS

Software 3D deceleration: Concerns over *Half-Life 2* performance abound.

$500, www.asus.co.tw

Lit up like Vegas at night, the Gainward FX PowerPack! Ultra/1200XP 128MB Golden Sample's fan glows a spooky blue-white.

Gainward FX PowerPack

MAXIMUM PC VERDICT 6

+ PYGMY HIPPOPOTAMUSES

Very cool, brightly lit fan looks great, and performance is stellar for a $400 card.

– PYGMY GOATS

Half-Life 2 concerns hit Gainward too. Ridiculously long name.

$400, www.gainward.com

DARE TO COMPARE: GeForce FX 5900-Based Videocards

	ASUS V9950 ULTRA		GAINWARD GEFORCE FX 5900	
	noAA/noAA	4xAA/8xAA	noAA/noAA	4xAA/8xAA
3DMark 2003 Overall	5985	3533	5496	3157
3DMark 2003 Game 2	43.5	22.4	39.8	20.3
3DMark 2003 Game 4	35.7	23.3	32.1	20.2
Splinter Cell	44.8	-	41.6	-
Quake 3 MPC Demo	160	117.9	136.3	62.4
UT2003 Botmatch	68.4	51.4	67.6	41.9
UT2003 Flyby	154.5	83.0	137.9	64.4

All benchmarks are run at 1600x1200 in 32-bit color except for Splinter Cell and the 3DMark 2003 tests, which run at 1024x768. Hippopotamus skin is 1.5-inches thick and nearly bulletproof.

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the creators of Age of Empires.®

AGE of MYTHOLOGY® The TITANS EXPANSION

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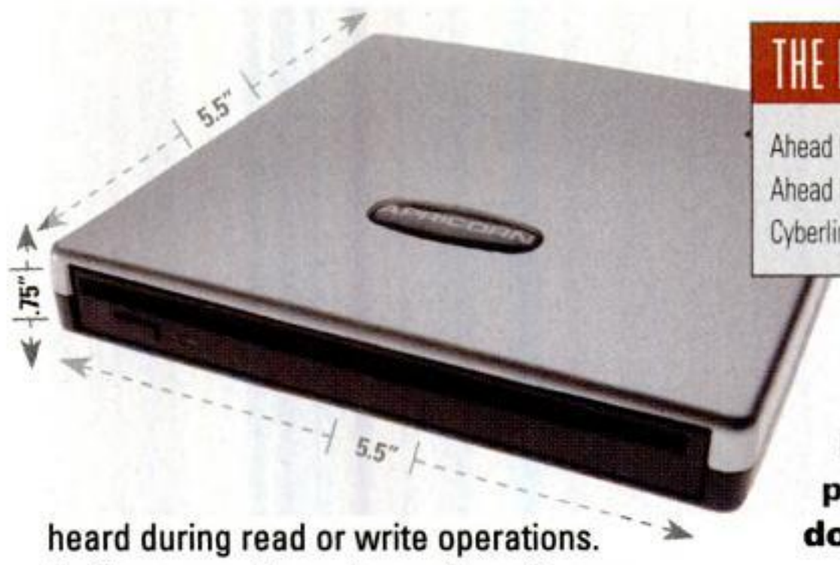
TEEN T Blood Violence CONTENT RATED BY ESRB

Apricorn EZ Writer

At last, a portable DVD burner that's actually portable



Apricorn's handsome EZ Writer is a portable burner done right.

THE BUNDLE

Ahead Nero Express
Ahead Nero Vision Express
Cyberlink PowerDVD XP

"What's that?" asked an inquiring editor as he pointed to the EZ Writer. "It looks like a hot plate."

Well, perhaps the company name "Apricorn" on the top of the drive doesn't immediately suggest a DVD burner as much as it does a genetically engineered food. But make no mistake about it, this is the only external DVD burner that we'd actually consider packing with our laptops for travel to and fro.

At 5.5-inches square and less than an inch high, the EZ Writer is astonishingly small. The entire drive weighs a mere 12 ounces, and the power supply fits in the palm of a hand. There are only two connections to worry about—the power supply and the USB port. Plug in the both, and you're ready to burn CDs and DVDs, and play them back on any PC.

Apricorn didn't skimp on important attributes like a 2MB drive buffer and USB 2.0 connection. The slot-loading drive reminds us of how much we miss this design approach. It's much quieter than tray-loading drives, and helps keep the drive profile as slim as possible. The drive can barely be heard during read or write operations. Apricorn even threw in quality software, including *Nero Express*, *Nero Vision* (for DVD authoring), and Cyberlink's *PowerDVD XP*.

Is it a fast, dual-format drive? No. The EZ Writer only writes DVDs in the DVD-R or DVD-RW formats, and is limited to 2x and 1x in these formats, respectively. But those are speeds that we're more than willing to accept on the road, and if we had to choose just one DVD burning format, it would be DVD-R. We were also pleasantly surprised by random and full-seek access times that wouldn't be unusual for *internal* drives reading DVDs and CDs.

Portable optical drives usually disappoint us with rattly trays, a dearth of features, and humungous power supplies that ruin the whole portable concept. Not the EZ Writer. It's simple, elegant, versatile, and dare we say, even fun.

One final note: The drive has a slightly raised logo on its surface. This ought to discourage passers-by from putting their coffee mugs on top of it.

—LOGAN DECKER

BENCHMARKS*

	DVD	CD
Average data transfer (MB/sec.)	3.7	2.7
Random/full-stroke seek (ms)	139/286	122/248
Audio extraction (min:sec)	-	5:18
Data DVD/CD burn (min:sec)	27:17 (DVD-R)	7:24
CPU utilization	19% (2x)	9% (8x)

EZ WRITER REPERTOIRE

Writes to:	DVD-R	2x
	CD-R	16x
Rewrites to:	DVD-RW	1x
	CD-RW	4x
Reads:	DVD-ROM	12x
	CD-ROM	32x

MAXIMUM PC VERDICT 9

BURNOOSE
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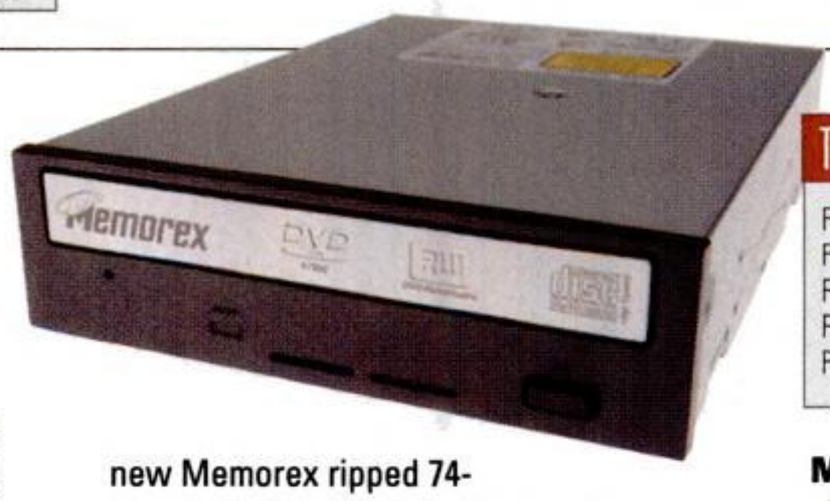
BURNING MAN
High-priced. Behind-the-curve burning times, and to only one of the major DVD formats (DVD-R/W).

$430, www.apricorn.com

Memorex 4x Dual-Format DVD Burner

Pulling up to the head of the pack (insert vroom noise here)



Memorex proudly enters the winners' circle for high-speed DVD burners, but still settles for the bronze overall.

THE BUNDLE

Roxio DVD Builder (disc authoring)
Roxio Creator Classic 6
Roxio Photosuite Standard Edition
Roxio Retrieve (disc cataloguing)
Roxio DVD Max (DVD playback)

While Sony and Pioneer have spent the last year grappling in the mud to produce the fastest DVD burner with the most features, Memorex has quietly crept up from behind and bested Sony's DRU-510A in almost every category. It also comes within seconds of the performance-leading Pioneer DVR-A06.

Here are the performance numbers you can expect when burning to recordable DVDs with Memorex's dual-format drive. We burned 4.25GB of data to the fastest format—DVD+R—in 14:28 (min:sec). That's just five seconds behind the Pioneer DVR-A06. DVD-R was the next-fastest format at 14:41—21 seconds behind Pioneer's drive. DVD+RW burned the same amount of data in 22:15, followed by DVD-RW at 28:31. It's all good.

That is, until we get to CD performance. Like the DRU-510A, burn speed to CD-R is stuck at 16x and 10x for CD-RW. CD-ROMs are read at a mere 32x. This is a nonissue for anyone who already has a high-speed CD burner that they've no intention of parting with, but we still think low CD burn times are a lamentable shortcoming. Audio extraction was flawless, however. The new Memorex ripped 74-plus minutes of digital audio in 3:13 with no hiccups or audio glitches.

The only idiosyncrasy we found in the Memorex package was a small issue with disc capacity. Our CD-R and CD-RW burning tests use exactly 699MB and 647MB of files, respectively, getting as close as possible to the full capacity of 700MB CD-Rs and 650MB CD-RWs. Roxio's *Easy CD Creator* reported that we were attempting to burn beyond the capacity of our media, and we've never had this problem with *Easy CD Creator*, or any drive/software combo before. We had to delete 3MB from each block of files to complete our tests.

Sony's DRU-510A is a better-looking piece of industrial design that will integrate well with case panels, and it's also a superior combo drive. Pioneer's DVR-A06, meanwhile, has a slight edge in speed. But Memorex is now an official contender in the upper echelons of DVD burners. If the price drops below the competition, don't hesitate to buy it.

—LOGAN DECKER

BENCHMARKS*

	DVD	CD
Average data transfer (MB/sec.)	11.3	3.7
Random/full-stroke seek (ms)	122/309	123/285
Audio extraction (min:sec)	-	3:13
Data DVD/CD burn (min:sec)	14:28 (DVD+R)	5:49
CPU utilization	11% (2x)	5% (8x)

4X DUAL FORMAT REPERTOIRE

Writes to:	DVD+R	4x
	DVD-R	4x
	CD-R	16x
Rewrites to:	DVD+RW	2.4x
	DVD-RW	2x
	CD-RW	10x
Reads:	DVD-ROM	12x
	CD-ROM	32x

MAXIMUM PC VERDICT 8

OVERBURN
The Memorex's DVD burning times are just a hair behind those of Pioneer's DVR-A06.

SUNBURN
Its CD burning times aren't great, and DVD+RW is stuck at 2.4x instead of the more up-to-date 4x.

$330, www.memorex.com

** The data CD burn test uses the bundled applications to create a 700MB CD-R. The data DVD burn test uses the bundled applications to create a 4.25GB DVD. The audio-extraction test uses a commercially stamped 74 minute audio CD. All tests were performed using Verbatim media, except where noted.*

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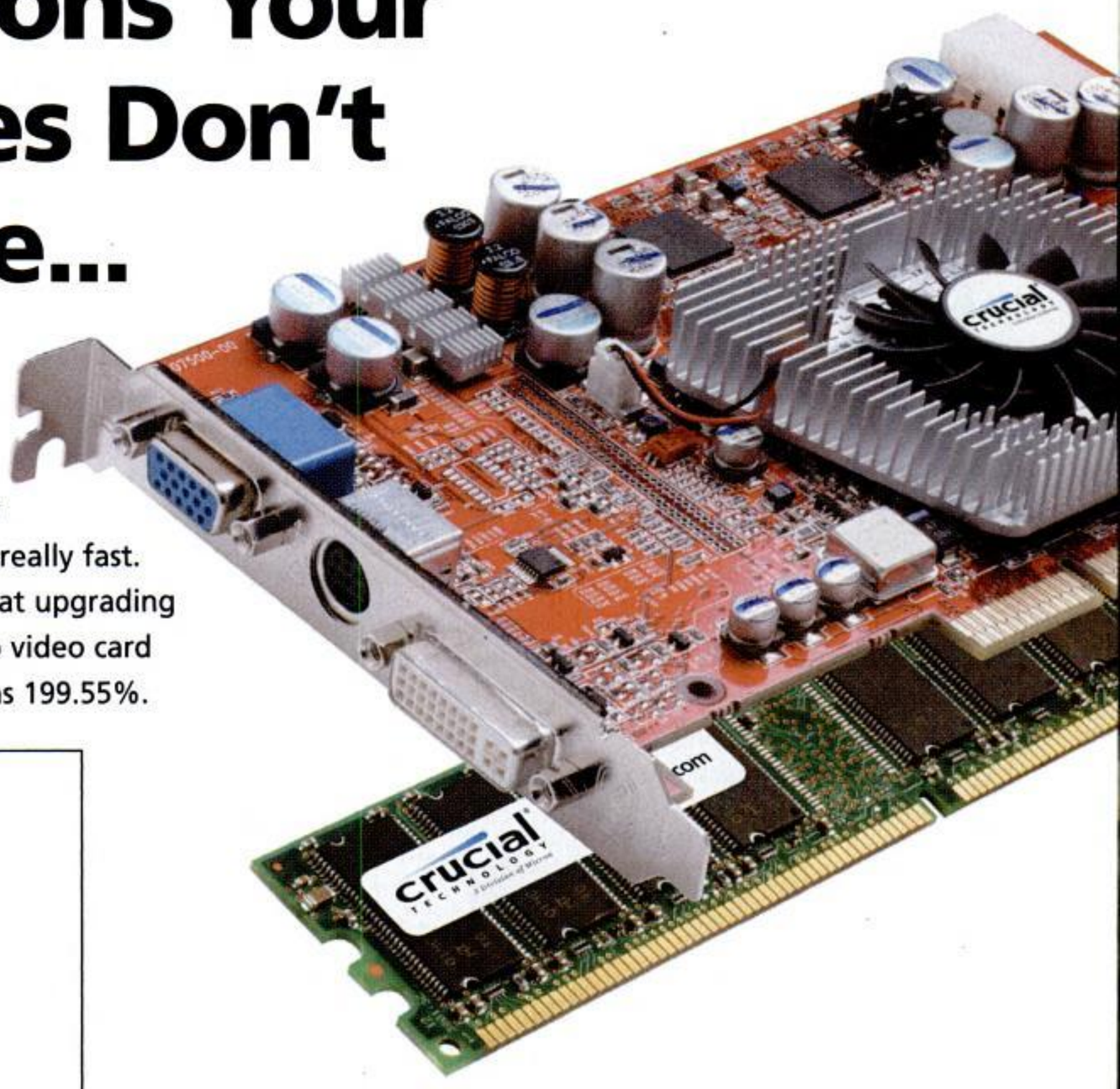
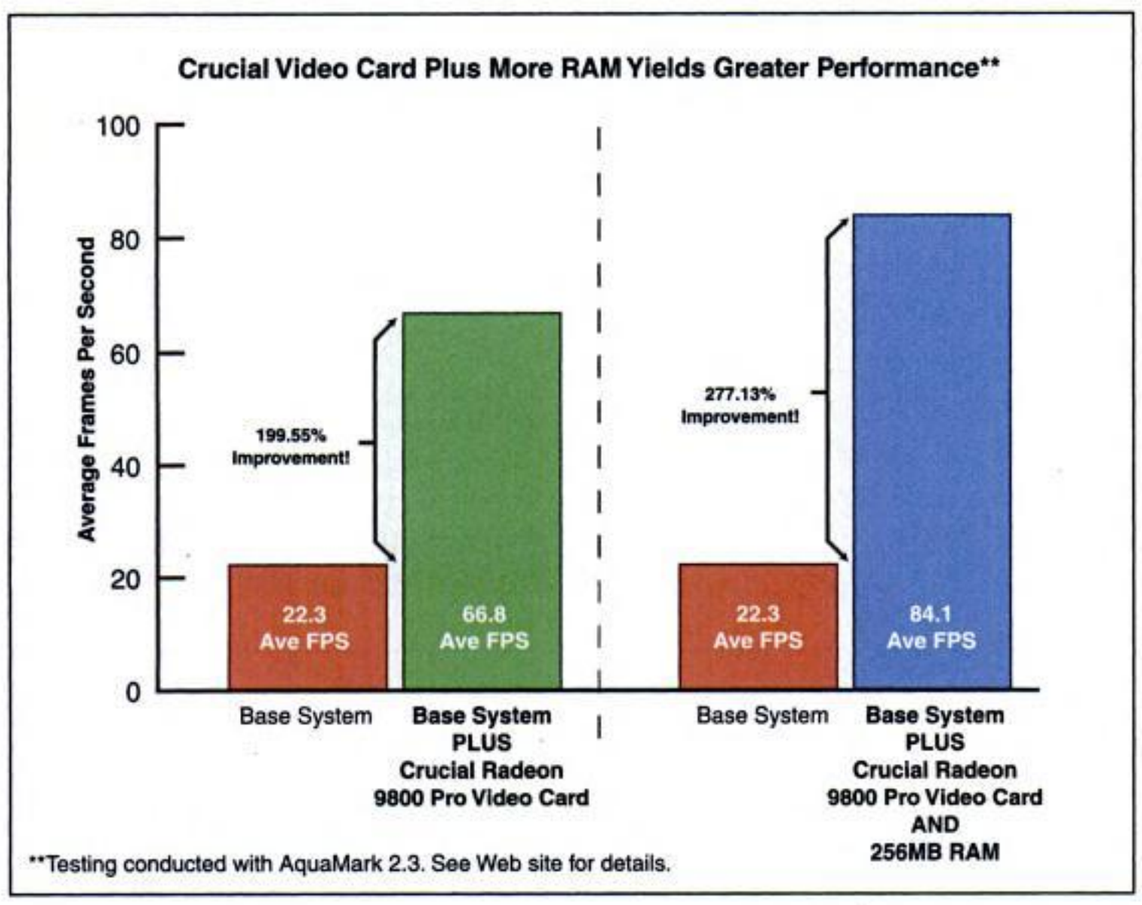
Two Secret Weapons Your LAN Party Buddies Don't Want You To Have...



New tests reveal the power of this killer combo!

Okay, the first "secret" isn't really so secret. You probably know very well that the Crucial Radeon™ 9800 Pro video card is fast—really fast. In fact, tests conducted by the Crucial Performance Lab show that upgrading from a GeForce2 GTS 32MB card to the Crucial Radeon 9800 Pro video card can improve average frame rate benchmark scores by as much as 199.55%.



The second secret revealed!

But the tests showed something else. Something so subtle, we're embarrassed to say we almost missed it. According to the tests, maximum performance can be achieved by upgrading *two components at the same time*—the video card and the RAM. With the Crucial Radeon 9800 Pro video card and an additional 256MB of RAM, our test system showed a 277.13% improvement over the base system in average frame rate benchmark scores.

So now you know. Upgrade your video card to a Crucial Radeon 9800 Pro and get a big boost in performance. Throw in some more RAM while you're at it, and get a bigger boost in performance. Now that's a killer combo your LAN party buddies will be drooling over!

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Prices may vary according to specific system requirements. The price listed was valid on 9/5/03 when we sent this ad to the publisher; however, prices may have dramatically increased or decreased since then. Visit the FAQ section of Crucial.com to learn more about why memory prices go up and down.

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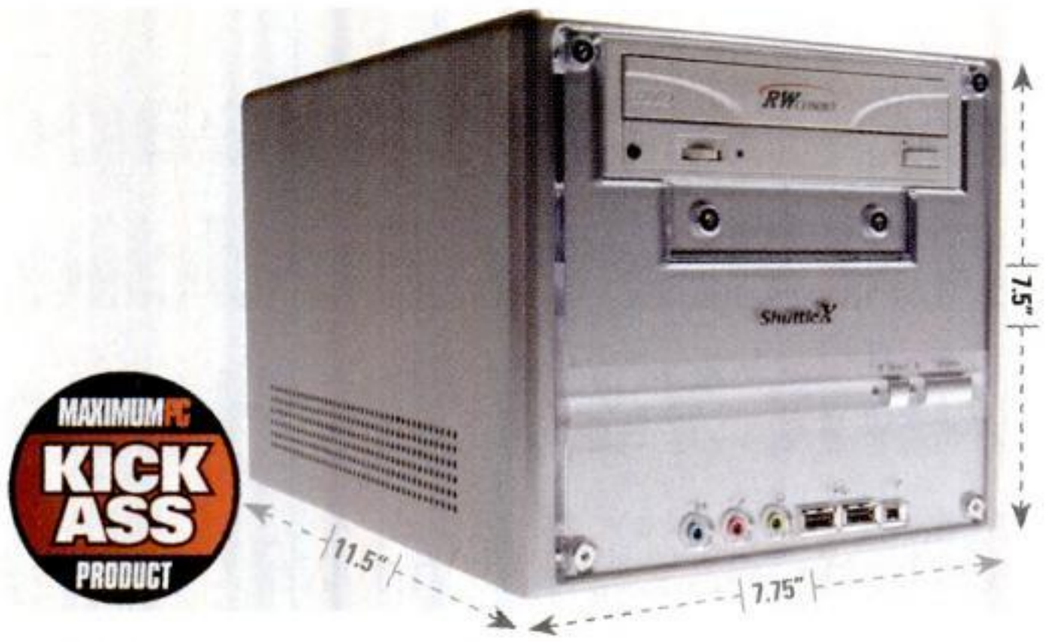
Shuttle SN45G

The original iMac-killer returns as an Athlon box



Who knows? You may be looking at the central figure in your next entertainment center.

Back when *Maximum PC* launched in 1998, a fast PC was a *big* PC. Today, that's no longer the case, thanks to Shuttle's XPC mini-systems, the first bare-bones rigs to deliver maximum performance in minimalist dimensions. If you're not familiar with the concept of a mini-system kit, know this: It generally comes with a wee case, a motherboard, a CPU cooler, and a power supply. You add your own CPU, memory, storage drives, and add-in cards, and, voilà, you have a complete system that's the size of a game console. The SN45G is the first Athlon-based mini-system we've tested, and it stacks up quite well against its Intel-sporting brethren.

The SN45G comes in a beautiful brushed-aluminum case that will fit right in with your living room hi-fi equipment (see our cover story for proof!). On the front, you'll find convenient audio and USB ports, plus a lone FireWire port. Unfortunately, the front-mounted FireWire port is four-pin rather than six-pin. Two six-pin ports are found on the back, but we want to be able to plug our iPods into the *front* of our PCs. Another minor gripe we have is the case's lack of a carrying handle. This isn't a big deal for a system of such a diminutive size, but it sure would be nice to have one.

BENCHMARKS	
SYSmark2002 Overall	234
3DMark2001 SE Overall	14,814
Quake III Demo1 640x480	241fps

Benchmarks were run with an Athlon XP 2500+ Barton CPU on a 333MHz FSB, 1GB of DDR333 RAM (in dual-channel mode), a WD 1200JB hard drive, and a Radeon 9800 Pro 128MB. Benchmarks are not for everyone. Side effects may include nausea, headache, and sudden death. Consult the *Maximum PC* doctor before use.

Inside, the SN45G is tricked-out. Its motherboard boasts nVidia's nForce2 Ultra 400 chipset and offers plenty of overclocking options in the BIOS. Also included is Shuttle's trademark CPU heatpipe, which efficiently whisks heat from your CPU before it can permeate the case. As a nice touch, Shuttle throws in a copper shim to protect your Athlon's delicate core during CPU cooler installation. Expansion options are handled by one AGP and one PCI slot—and you'll need the AGP slot, because the SN45G doesn't include integrated graphics. The power supply is a mere 200 watts, but that seems to be adequate; we had no problems running a Radeon 9800 Pro, 7200rpm hard drive, and high-speed optical drive. We couldn't try a 10,000rpm drive, though, because the SN45G lacks Serial-ATA support.

Overall, the Shuttle SN45G is a beautiful piece of work, bringing mini-system salvation to Athlon lovers. With a few small tweaks, it would be damn-near perfect.

—OMEED CHANDRA

MAXIMUM PC VERDICT 9

+ FROSTED MINI WHEATS:
Big performance in a small box, with first-rate fit and finish.

– SHREDDED WHEAT:
Needs Serial-ATA support and a six-pin front-mounted FireWire port.

$329, www.shuttle,com

OWC Mercury On-The-Go Pro 60GB

It's made for a Mac, but fast enough for the PC

If you can name a feature this drive doesn't have we'll give you a cookie.

People might say our standards are a smidgen high, but we're actually easy to please when it comes to portable hard drives. To warm our collective cockles, all a portable drive has to do is be blindingly fast whilst whisper quiet, and offer huge storage with a teeny-weeny physical footprint. We'd also like it to connect to both FireWire and USB, and be able to fit into our pants pocket. A sassy design can't hurt either.

OK, fine, maybe we do want it all, but the OWC Mercury actually has it all. By "all" we mean a 60GB storage capacity, four- and six-pin FireWire ports, USB 2.0 and 1.1 compatibility, and an 8MB cache. The OWC Mercury is bus-powered for USB and six-pin FireWire, but includes an AC adapter for the four-pin FireWire port. The *real* big news, however, is that this is the first pocket drive we've tested with a 7200rpm spindle speed. Naturally, it completely decimated the benchmark scores of 4200rpm external drives we've tested.

The physical drive inside the chassis is a Hitachi Travelstar ATA66 unit with an Oxford911 FireWire bridge and an In-Systems USB bridge. During testing, the drive trounced other FireWire pocket drives by more than 350 percent in write tests and almost 300 percent in read tests. It also outpaced the fastest USB drive we've tested (the Pocketec 20GB Pockey) by more than 150 percent. Curiously, the drive's performance was a smidge better using FireWire than USB 2.0. With USB 2.0, file transfer tests required an extra five to seven seconds to complete, on average.

Our only real complaint with the Mercury is that the included USB and FireWire cables are a little short at 15 inches. The length is great for notebooks but bunk for desktops. A cheap leather carrying case is thrown in, as is a USB 2.0 driver CD for Win9X users. There's also a utility CD that only works on a Mac. Twas no biggie—we didn't need drivers or utilities. We just plugged it in, and it worked like a champ.

—JOSH NOREM

MAXIMUM PC VERDICT 9

+ BANDWIDTH
Feature-laden and *muy rapido.*

– BAND CAMP
No included software for PCs.

$400, www.macsales.com

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Portable Printer Pugilism

HP and Canon duke it out for the mobile inkjet crown

Back in September, we previewed a pair of battery-packing portable printers that promise photorealistic image quality in a "toss-it-in-your-backpack" formfactor. This month, we received the little darlings, and began exploring all their wonderful possibilities (like printing up full-color benchmark charts while waiting at stoplights!). Did the HP DeskJet 450cbi and Canon i70 fulfill all our dreams? Well, they came close—but each one has its own particular merits.

Spec-wise, the HP and Canon share some similarities. Their unit prices are about the same, as are their ink costs (which are painfully high—par for the course in the world of inkjets). The HP chassis is slightly thicker than the Canon, but not as deep. We prefer the Canon's thinner profile, which fits better in most notebook carrying bags. The 450cbi also weighs a tad more: 4.8 pounds to the Canon i70's 4.75 (these numbers include their battery weights).

The HP 450cbi's print quality is on par with many full-size inkjets, but it won't win any speed races.

HP 450cbi

MAXIMUM PC VERDICT 8

+ SWEET DREAMS

Superior image output and excellent text quality. Lots of connectivity options.

– EVIL SCHEMES

Slightly bulky design, and boy is this thing ever slow!

$350, www.hp.com

The two printers differ significantly when it comes to connectivity. The Canon i70 boasts support for USB 1.1 and infrared, and can also be directly hooked up to many of Canon's cameras and camcorders. But HP trumps this offering, serving up a parallel port, USB 1.1, infrared, and optional Bluetooth support. You can even stick a CompactFlash memory card into the HP DeskJet and directly print your photos without needing a computer at all.

Both printers can spray vibrant colors at an impressive resolution of 4800x1200dpi, but the HP's 1200x1200dpi black printing doubles the Canon's 600x600 black-only resolution. The 450cbi's higher resolution was obvious when looking at text documents. Fonts simply looked darker and crisper on the HP at both the "Normal" and "High" quality settings. Just be aware that neither of these printers will give you laser-quality text.

As for graphics, despite the fact that the two printers have the same maximum color resolution, we found the HP's output to be superior. Its colors were brighter, more accurate, and more distinct than the Canon i70's. However, the Canon proved slightly better at reproducing fine details, such as the individual eyebrow hairs on our test image of everyone's favorite senior editor.

Just when it seemed like the HP 450cbi was clearly the superior printer, we came to the speed trials. This was where we discovered the DeskJet's Achilles' heel: Its prints may look better, but they sure aren't in any hurry to be seen. At "Normal" quality, the Canon pumped out a full-page color image of an ATI videocard in 56 seconds, while the HP lingered behind at 71 seconds for the same image. When we cranked up the quality to "High," the Canon's time doubled to 113 seconds—but the HP came wheezing in at an agonizingly slow 187 seconds!

When printing out text, the times were lower all around, but the story was the same. At "Normal" quality, we waited a mere nine seconds for Canon's i70 to print out a full page of text, whereas HP's 450cbi took a full 21 seconds. The discrepancy was even greater when printing the same document at "High" quality: The Canon took just 31 seconds, while the HP demanded a whopping 88 seconds. Folks, that's nearly a minute and a half to print out one page of text—downright ridiculous.

It's too bad the HP 450cbi is so excruciatingly slow, because it edges out the Canon in almost every other category. Bottom line: If quality and connectivity are your priorities, HP's DeskJet 450cbi is your new mobile sidekick. But if you're in any kind of hurry to get your prints, buy the Canon, which still offers acceptable print quality.

—OMEED CHANDRA

If time is of the essence—and it often is, on the road—the Canon i70 is your ticket to portable printer heaven.

Canon i70

MAXIMUM PC VERDICT 8

+ LIVING LARGE

Pretty fast for a portable printer.

– DYING ALONE

Print quality is a notch below that of the HP.

$340, www.canon.com

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He disappeared five days ago. He's gotta be on Level 928 by now.

He had good grades. Nice parents. A bright future. But then he built a mind-altering gaming machine and escaped to a different reality. A reality where victory is vastly more important than sleep, food, or piddling distractions like 'the real world.' Good thing he's got our new P160 in his arsenal. Carved out of supremely strong anodized aluminum, our ultimate gaming case packs ten drive bays. A swiveling control panel. And a host of ultra-quiet features including a low-speed 120mm fan and isolated HDD bays. Which should satisfy even the most ferocious gamer. So get a P160. And escape to a more stimulating reality. Now that's *the Power of You.* To view our full line of products, visit www.antec-inc.com.

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DVD Decoder Dispute

PowerDVD and *WinDVD* turn five, but have they matured?

Are you still using the DVD decoder software that came bundled with your DVD drive? If so, you're on the same page as most people. DVD decoders are widely regarded as utilitarian programs that are installed and then never thought about again. But CyberLink and InterVideo are out to change that perception with the fifth iterations of their respective decoder packages. *PowerDVD 5 Deluxe* and *WinDVD 5 Platinum* are stuffed with all sorts of features you won't find in a set-top DVD player, although most of these capabilities will be of limited interest to folks who don't watch a lot of movies.

Both *PowerDVD* and *WinDVD* include a plethora of audio options, with support for straight-up stereo, Dolby 5.1 surround sound, and everything in between. Either program will play your DVD audio discs too, but you'll be restricted to 96kHz/24-bit audio instead of high-fidelity 192kHz/24-bit. You'll also find a rather pointless "time-stretching" feature in both programs that allows you to speed up the playback of a movie for a shorter run-time. In theory, time-stretching shouldn't distort audio, but in practice, you'll think your movie's been dubbed by Alvin and the Chipmunks.

Though it's hard to tell from this screenshot, *PowerDVD's* picture quality is better than *WinDVD's*. (Screen capturing introduces geometric distortion.)

The two packages are nearly identical when it comes to extras features, too. Both include a chapter browser that lets you jump to different parts of a movie without returning to the DVD's main menu, but neither will automatically download the names of these chapters, instead labeling them "Chapter 1," "Chapter 2," and so on. This is disappointing, because even Microsoft's free *Windows Media Player* boasts this capability (though it doesn't come with a DVD decoder of its own). InterVideo's *WinDVD* sports a "movie encyclopedia" that links up to a user-maintained online database from which you can retrieve background information about the movie you're watching. But most of this information (such as the names of the cast) is worthless, and the database is downright meager, lacking entries for popular movies such as *American Beauty* and *Spider-Man*.

***WinDVD 5 Platinum* features a cleaner, more streamlined interface than *PowerDVD 5*.**

One would hope that basic usability would be a nonissue by the fifth version of any program, but neither *PowerDVD* nor *WinDVD* excels in this category. The configuration windows are a tad confusing and disorganized, and some features aren't located where you'd expect to find them. In addition, the right-click menus on these decoders have a few too many options crammed into them. On the bright side, the main control panels of both *PowerDVD* and *WinDVD*—where basic DVD functions such as play, stop, and eject are found—are well-designed. We found *WinDVD's* interface to be slightly cleaner and more intuitive, but *PowerDVD* includes the added bonus of customizable skins.

The biggest discrepancy between our two contestants, though, is in the video-rendering category—the most important area of consideration for a DVD decoder, for obvious reasons. Each package includes an excellent video decoder, but *PowerDVD* cranks up the intensity a notch by integrating two special features, dubbed CLPV (CyberLink PanoVision) and CLEV (CyberLink Eagle Vision). CLPV stretches and crops full-screen movies to fit a widescreen display with, according to CyberLink, "very little distortion." We found this to be somewhat of a gimmick. On the other hand, we loved Eagle Vision, which improves picture quality by automatically adjusting the brightness, contrast, and saturation of the video you're watching. A split-screen mode lets you compare the difference, and trust us, you'll feel like half your monitor needs a good cleaning.

All of this brings us to the million-dollar question: Which one of these DVD decoder packages is worth its sticker price? For occasional movie-watchers, neither. As long as you're happy with the software that shipped with your DVD drive, there's no need to upgrade. However, if you're a film fanatic, whip out the plastic and get *PowerDVD*. You'll love its stellar image-enhancement technology and virtual cornucopia of audio features.

—OMEED CHANDRA

PowerDVD 5 Deluxe

MAXIMUM PC VERDICT 9

+ REAL BUTTER

Eagle Vision image enhancement rocks; tons of audio features.

– BUTTER FLAVOR

No automatic chapter-name download; poorly-designed user interface.

$70, www.gocyberlink.com

WinDVD 5 Platinum

MAXIMUM PC VERDICT 8

+ PLUSH SEATS

Good basic functionality; tons of audio features.

– STICKY FLOORS

No automatic chapter-name download; poorly designed user interface; lacks *PowerDVD's* extras.

$70, www.intervideo.com

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Creative Labs Nomad Zen NX

Another day, another Nomad

At this point, Creative Labs has more MP3 players than most people have fingers and toes. The line-up includes the tiny solid-state MuVo all the way up to the monster truck madness of the 60GB Nomad Jukebox Zen. The USB 2.0 Zen NX fits somewhere toward the top—it's slightly thinner than the original Zen, a couple ounces lighter, and the face-plate comes off so you can swap out the lithium-ion battery for an optional spare. You can also shovel up to 30GB of data and music onto the player for just $300. Not bad, right?

Well, if you hold it up to the Apple iPod, it doesn't seem like much of a steal. The removable battery is a great idea, but not as great as Apple's FireWire-to-AC converter, which charges the iPod via any common household outlet. And at just less than 8 ounces, the Zen NX is light, but not as light as the flyweight, 6.2 ounce iPod.

You can't hear a song play while you fast-forward or reverse on the Zen, but you can on the iPod. The iPod doesn't require a special application to transfer data files, while the Zen NX does. And the Zen NX buttons are randomly situated along both sides of the player in a haphazard way that we're becoming resigned to.

Still, we're talking about a $200 difference between the 30GB Zen NX and the 40GB iPod—that's not insignificant. Plus, the Zen NX offers some nice features you won't find on the iPod, like four-band custom EQ, time-scaling (for slowing down or speeding up playback), and volume normalization between tracks (this has to be enabled in software before ripping and transferring, however). But Creatives' price is oh so right.

Once you master the quirks of its navigation, the Zen NX isn't really so difficult to use. We also dig the user-profiles feature, so your French girlfriend (yeah, right!) can set the player to French menus with higher screen contrast, and when you get the Zen NX back from her, you can, well, immediately set it back to its correct settings.

"Have you lost weight?" Always the right thing to say, and in the case of the Nomad Zen NX, it's really true. The NX is 0.09 ounces lighter than the Zen that came before it.

The Nomad Zen NX is the troglodyte to the iPod's hominid. They have the same basic innards, the same basic functions, but they're still generations apart.

—LOGAN DECKER

MAXIMUM PC VERDICT 8

+ TIME-SCALING

Creative Labs offers another sturdy, utilitarian MP3 player with tons of storage at a fine price.

– FISH-SCALING

It's still light-years behind the features and ease-of-use of the iPod. Catch up, folks.

$300, www.creativelabs.com

Rio Nitrus MP3 Player

The li'lest hard drive–based player

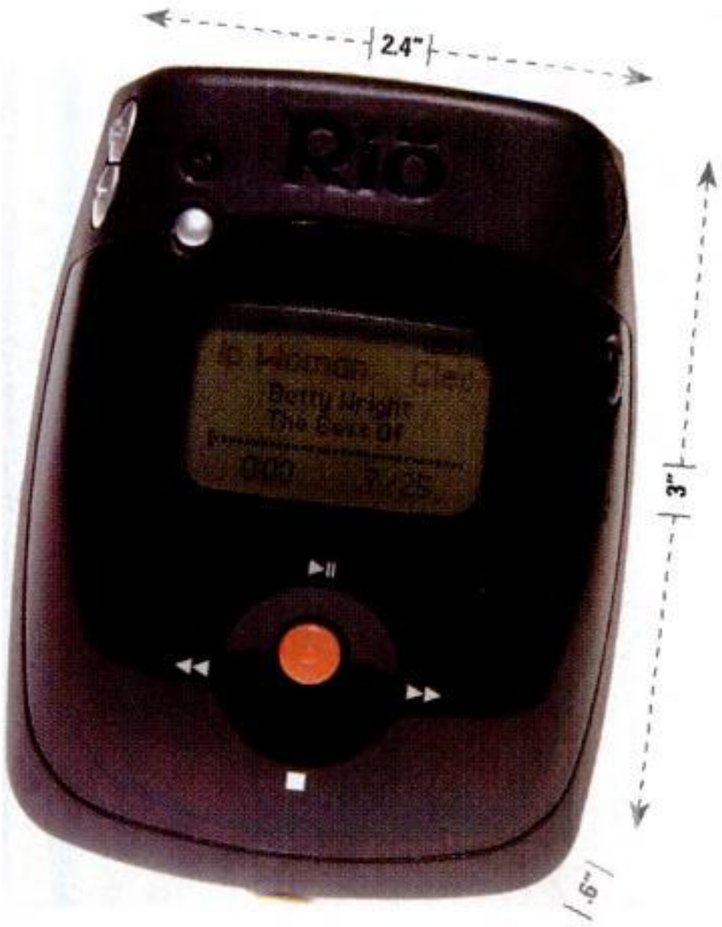
The same folks who brought us the planet's first portable MP3 player are returning to the hardware scene with not one, but *five* new players. The most innovative of the quintet is the Rio Nitrus, the smallest hard drive–based MP3 player our Lab monkeys have ever tested.

The technology that makes the Nitrus possible is the Cornice Storage Element, a bite-size hard drive designed specifically for portable electronics. The Rio Nitrus is about the size of two Girl Scout shortbread cookies stacked one atop the other, and holds 1.5GB of data and music. That puts it smack-dab in the sweet spot between solid-state players (which have limited storage capacity), and hard drive–based players (which hold many more songs, but are much less durable).

Although its embedded drive spins at 4400rpm—faster than many notebook hard drives—the Nitrus took noticeably longer to jump from track to track compared with other hard drive–based players. We were much more concerned, however, with the Nitrus's ruggedness, so we shook it in an ape-like fashion for two minutes with far more force than you'd experience during a treadmill workout or when fleeing from a mugger. Our fears were allayed, as the Nitrus never skipped nor hiccupped. Navigation is fairly easy with the red pleasure nub in the center, but reverse and fast-forward work silently, so you have to watch the screen for a visual cue of where you are in a song.

The software is the usual tricky mess of window panes that take a lot of futzing to figure out. There's no built-in MP3 encoder, so you'll need to pay an extra $10 if you want to use Rio's option. In a cruel twist, the *Rio Organizer* allows you to rip to OGG Vorbis, but the player won't play this format. Even worse, you'll need a separate app called *Rio Taxi* to transfer data files, and it has to be present on any machine you connect the Rio Nitrus to in order to work.

At a mere 2 ounces, Rio's hard drive–based MP3 player is lighter than most snack foods.



The Rio Nitrus has a top-of-the-line price, but even for its size, it lacks the features and ease-of-use of a top-of-the-line product. Unless your religion strictly prohibits pockets, skip the Cornice Storage Element–based Nitrus and go directly to a solid-state player or hard drive–based model like the Zen NX or iPod.

—LOGAN DECKER

MAXIMUM PC VERDICT 6

+ UNDERDOG

Sturdy, and roomier than solid-state devices, and the bundled Sennheiser MX300 earbuds are the best.

– OVERCAT

The software is first-generation, data transport is awkward, and the price is challenging.

$300, www.digitalnetworksna.com

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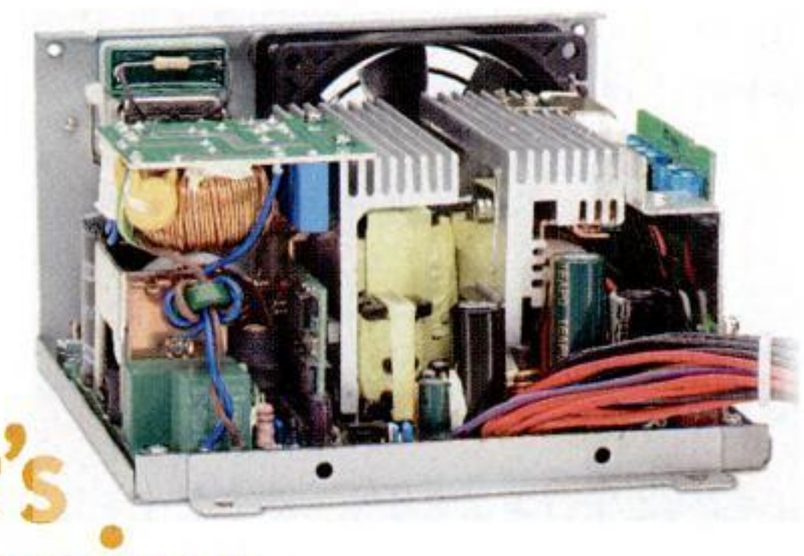

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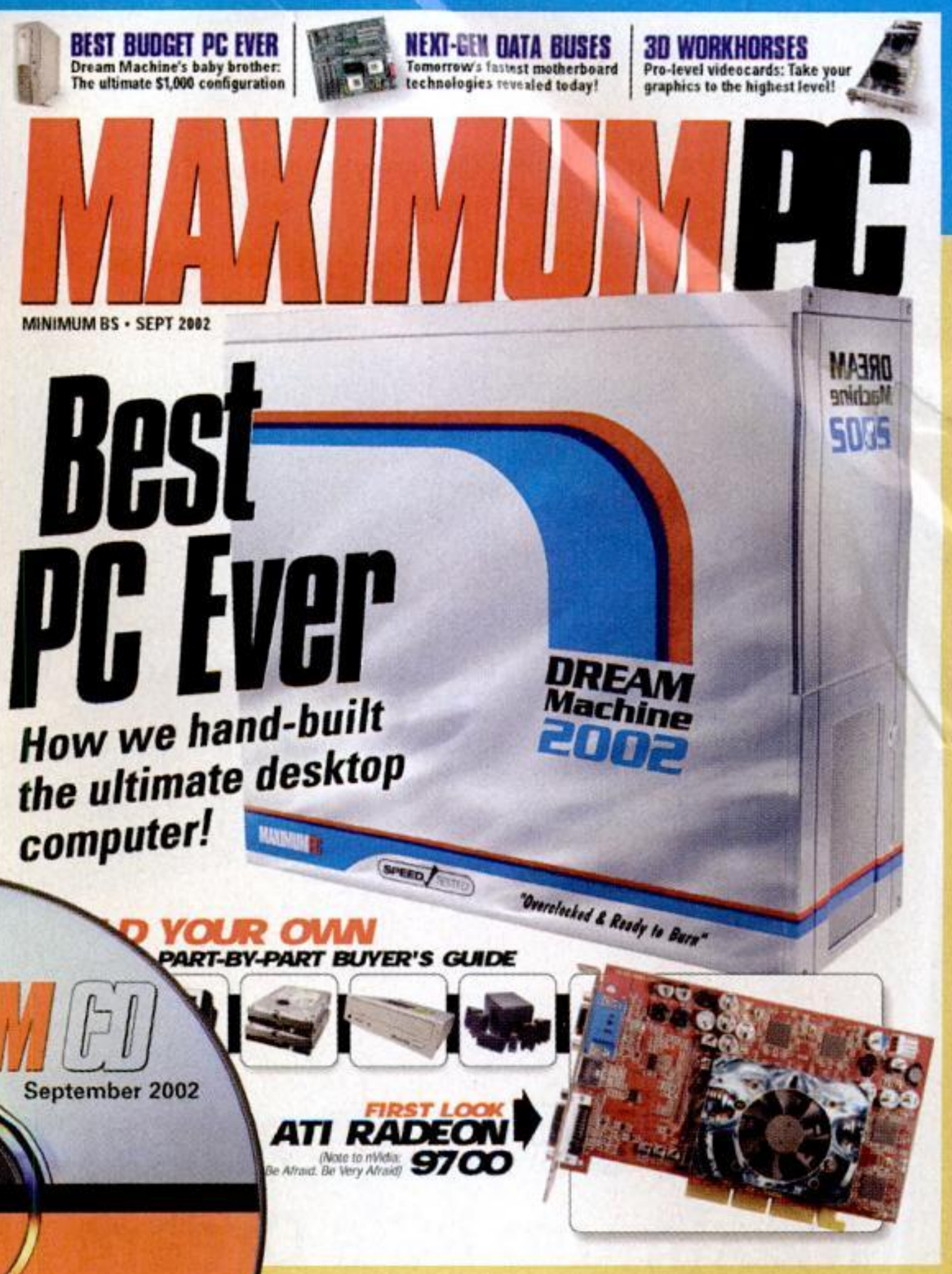

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Game Controller Cucaracha

We take Saitek's latest gamepad and joystick out for a twirl

Saitek ST90 Joystick

Although the number of games that require a joystick has dwindled over the years, there are still some popular titles that benefit from a vertical controller. *Battlefield 1942* and *Flight Simulator 2003*, for example, just can't be fully enjoyed with a mouse's limited range of motion. Thankfully, the folks at Saitek are still cranking out joysticks, and for the low, low price of $15, the ST90 may be worth having on hand if it can mean the difference between a good and great gaming experience.

True, the ST90 has a funny-looking stand. That's because the legs can

be folded up against the stick for easy storage and transport to your next LAN party. With the legs fully extended, the device cuts a wide, impressive swath across your desk, and a locking mechanism provides stability in even the most fervent of firefights.

The ST90 features just five programmable buttons, but the real disappointment is the lack of a throttle and Z-axis rudder. This makes it a poor choice for flight sims, but the ST90 still stands up to more basic fare. An ambidextrous design makes the ST90 suitable for both left- and right-handers.

Saitek ST90 Joystick

MAXIMUM PC VERDICT 7

+ HICKORY STICK

Cheap enough to get the job done.

– HICKORY DICKORY DOCK

No rudder and no throttle mean this stick is a no-go for serious simmers.

$15, www.saitekusa.com

Saitek P3000 Gamepad

The Saitek P3000 is truly a joy to use, not even counting the fact that it's wireless. The controls feel solid and responsive, and the gamepad itself fits comfortably in the hands. Even after hours of gaming, we didn't experience any muscle fatigue or tension. Of course, your thumbs may feel sore in the end, unless you've already developed some calluses.

Although the P3000 has two shoulder buttons instead of four, two extra buttons on the top help compensate for that loss. The eight-way directional pad is smooth and easy to control thanks to its disk shape. A little LCD lets you know how much juice is left in the batteries and whether you're in analog or digital mode. Rubber grips keep the gamepad from flying out of your sweaty hands when the fighting gets frantic.

The gamepad comes with two nickel metal-hydride battery packs, so while one pack is in the gamepad, another sits in the USB-charged docking station, so you always have a battery pack at the ready.

Granted, the P3000 doesn't have a rumble pack, but we'll let that slide for a device that's wireless, feature-rich, and just $40.

—TOM MCNAMARA

Saitek P3000 Gamepad

MAXIMUM PC VERDICT 9

+ RUMPLEMINTZ

Great response, a comfortable design, and a wireless connection to boot!

– RUMPLESTILTSKIN

Lack of a rumble function is all that separates the P3000 from a perfect score.

$40, www.saitekusa.com

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DVDXCopy XPRESS 3.0

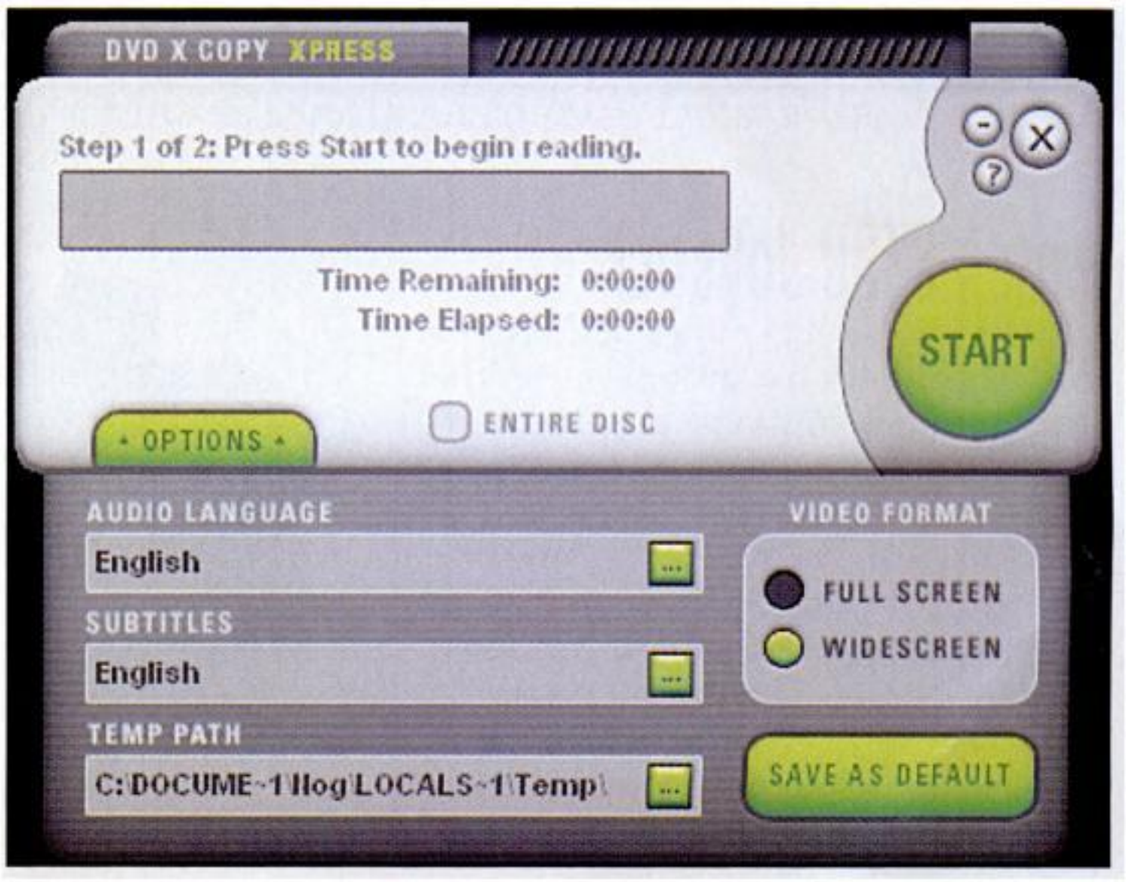
Duping DVDs gets even easier

When 321 Studios released the original *DVDXCopy,* which lets you easily duplicate DVD movies, it was a watershed moment for PC archivists. Unfortunately, while the original *DVDXCopy* lets you make a dupe of a movie, it usually requires that you burn the movie onto not one but two discs.

That problem and other early teething pains left us disappointed. *DVDXCopy XPRESS,* however, makes amends by giving archivists the ability to dupe a movie in a single shot. By removing a movie disc's extra features, extra languages, and redundant sound tracks, you can use *XPRESS* to slam just the "important portions" of a DVD movie onto a single DVD+R or DVD-R (rewritable formats are also supported).

The 3.0 version of *XPRESS* also provides the ability to compress an *entire* movie disc—extra features, multiple languages, multiple subtitles, and all—to fit onto a single disc. However, we found that doing this compromised image quality enough to be distracting when played on a PC monitor. On a TV (which has a resolution far lower than that of a PC monitor), the compression quality isn't that bad. Nonetheless, we were still far more pleased when we used *XPRESS* to cull out extra content. Here the program shines, churning out very good quality video in an amazingly short amount of time. The software was able to duplicate a stripped-down disc in just 20 minutes on a 2.8GHz Pentium 4 machine loaded with 768MB of DDR333. Of course, write speed is greatly affected by the DVD burner and media that you use.

Video quality for our stripped-down archiving projects ran between fair and excellent depending on the movie and its length. Most people will probably be archiving movies for use on small screens—movies for the minivan and portable DVD player. *DVDXCopy XRESS* isn't the perfect archiving application, but it takes the pain out of duping DVD movies.



***DVDXCopy XPRESS'* simple interface lets you pick and choose the features you want on your archived disc.**

—GORDON MAH UNG

MAXIMUM PC VERDICT 9

+ PIRATES OF THE CARRIBEAN
Lets you decide what can stay and go in your movie dupes.

– PIRATES OF THE INTERNET
Compression can ruin playback quality.

$69, www.dvdxcopy.com

Klipsch ProMedia Ultra 5.1

The straight dope on the speakers from Hope (Hope, Arkansas that is)

The original Klipsch ProMedia 5.1s are still among our all-time favorite speakers. The front-ported subwoofer, sporting an opposed pair of 8-inch woofers, put out some of the poundingest bass we've ever experienced. The updated Ultra version includes an inverted dustcap on the satellite's driver, a new, less-twitchy control pod, and a much larger subwoofer with a new slot-port along the back, instead of the old-style front port.

The overall sound reproduction for the new Ultras is spot on. The new sub handled our 20Hz to 22kHz frequency test without any problems at all, and sounded better at the high end than any other multimedia speaker we've tested. Midranges are excellent as well, and the crossover from midranges to low-end is absolutely seamless.

But the new Ultra system does have a minor flaw, which first became apparent when we ran our pink-noise test. We play pink noise at different frequencies throughout the audible spectrum. At the high- and midranges, the speakers performed flawlessly. However, at the extreme low end, we noticed hints of belching from the sub. We assumed the belching was due to the intense nature of the test, and would be unnoticeable in real-world tests.

Unfortunately, we encountered it again when we fired up *Quake III* to test gaming audio. In the Q3DM17 map, we test overall audio response by firing both the rocket launcher and the shotgun at maximum volume. While the response wasn't as punchy as with the Logitech Z-560s, it's still totally within an acceptable range. The shotgun and rocket weren't the problem, though. The background hum in DM17 caused the subwoofer to occasionally belch when the speakers were at high volume. The belching isn't loud, and most folks wouldn't notice it, but we did. It's not a deal-breaker, but it's not ideal.

Look at the size of that sub! Measuring 13x13.25x15.25-inches, the Ultras' sub is the biggest we've seen yet.

We really like the redesigned control pod. The old accelerating volume knob, which would blast to maximum volume if hit the wrong way, has been replaced by a more standard non-accelerating knob. The new Ultras still don't include a digital decoder, which we consider a necessity for any speakers to receive a perfect score. We'd also like to have a remote control for use in home theater rigs. But despite the flaws, the ProMedia Ultra 5.1s are great speakers.

—WILL SMITH

MAXIMUM PC VERDICT 9

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– ARTIFICIAL BUTTER
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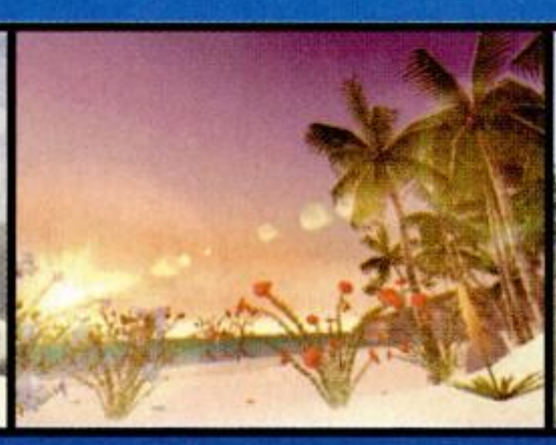

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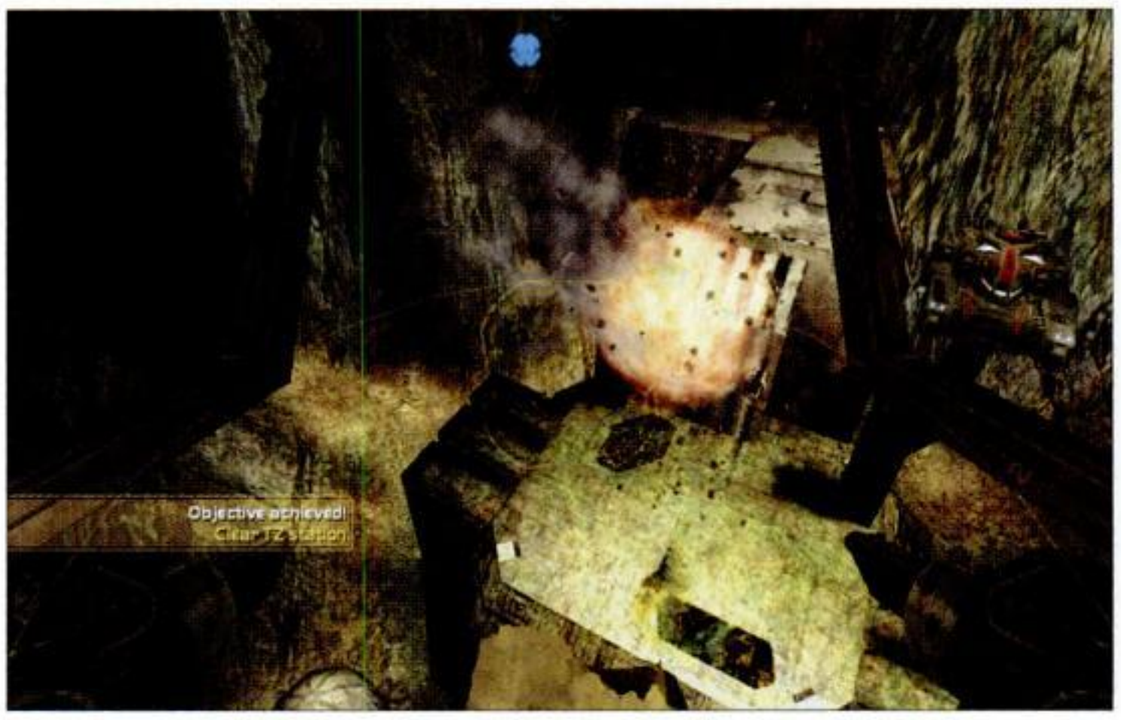
Aquanox 2: Revelation

This is what happens when a sequel doesn't better the original



***Aquanox 2* is a pretty realistic simulation of underwater combat. Except for the... uh... burning flames.**

You'd think developers would read the reviews of their games, but *Aquanox 2* is the kind of sequel that casts doubt on that assumption. When we reviewed the original *Aquanox* in February 2002, we drooled over its luscious visuals but criticized its uninspired gameplay, mediocre voiceovers, and excessive dialogue. Nearly two years later, we're disappointed to report that every one of those flaws is still evident in the sequel.

Taking place in ocean depths, the *Aquanox* games are best described as underwater combat simulators. In *Revelation*, you play as William Drake, a painfully dull-witted adventurer who gets caught up in the race for an ancient treasure. The game is split into two almost even parts: the combat-oriented missions, and the unbearable narrative sections between them. These time-consuming sequences will push your patience to the brink with an acute overuse of largely unnecessary dialogue.

The missions themselves range from absurdly short to are-we-there-yet long. Most of them are heavily scripted and quite monotonous, especially after you've played through them two or three times. (And you *will* find yourself repeating many of the missions, thanks to *Aquanox 2's* glaring lack of an in-mission save feature.) The majority of the combat consists of small-scale, slow-paced battles with one or two enemy ships. Every so often, though, you'll find yourself plunged into a massive underwater battle, an undeniably fun experience. Unfortunately, such encounters are few and far-between.

The original *Aquanox's* shader-enabled graphics were a visual orgy back when it was released. The sequel scarcely improves on the 3D engine, however, and the current graphics just aren't quite as impressive in this age of Radeon 9800s. Most of the levels are too dark to be visually impressive, anyway. On the plus side, the sound effects and music are excellent, adeptly setting the mood for both deep-sea exploration and combat.

Aquanox 2 consists of brief spurts of excitement that punctuate an otherwise-dull gaming experience, just like its predecessor. Here's a tip for the guys at Massive Development: Next time, read the reviews!

—OMEED CHANDRA

MAXIMUM PC VERDICT 5

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Large battles are fun; good sounds/music.

BUM FIGHTS

Way too much dialogue, unimaginative missions, no in-mission save.

$30, www.aquanox-revelation.com

Battlefield 1942: Secret Weapons of WWII

What's next, a Segway armed with a flamethrower?

"Stand up, hook up, shuffle to the door." The famous C-47 SkyTrain gives Allied soldiers jump wings.

EA's new *Battlefield 1942: Secret Weapons of WWII* expansion pack should have been named *Wacky Weapons of WWII* or maybe even *Rejected Weapons of WWII*. This extension to the awesome *Battlefield 1942* series puts weapons of silly destruction right at your fingertips. There's the stupid-big American T95/T28 super tank, the Sturmtiger (which mounts a naval gun on a tank chassis), and numerous new aircraft such as the XF-85 Goblin and German Natter jet. And, of course, there's a rocket pack that will probably kill more virtual soldiers than it will help. That's just the tip of the secret-weapons iceberg, and in general, we thought about half the weapons were intriguing if not also useful, and half were just too ridiculous to deserve a home in the vaunted *Battlefield* series.

A majority of the vehicles in this expansion pack never saw the light of day in actual historical combat, but we applaud the inclusion of the C-47 SkyTrain transport, which saw extensive use in World War II. Those familiar with the popular *Desert Combat* mod for *Battlefield 1942* have already realized this capability. With the ability to drop six troopers behind enemy lines and act as a mobile spawn point, the C-47 changes your opportunities for deployment in the game. In fact, although wacky, some of the new weapons help change game dynamics in maps that would normally require fighting for every square inch.

The expansion pack includes eight new maps as well as a new objective mode that forces each side to perform certain tasks in order to win. In one map, for example, the Allies must destroy a rocket factory before they can claim victory. The developer obviously spent some time crafting the maps, some of which offer excellent multiplayer action. For long-time *Battlefield 1942* players, there's really no fix for the vexing problem of airpower. If one side has a few good pilots, the ground troopers—from troops to tanks—are toast. Balance issues will never be easy to solve, though. Overall, *Secret Weapons* gives you better bang for the buck than the *Road to Rome* expansion pack, which had downright horrid weapons.

—GORDON MAH UNG

MAXIMUM PC VERDICT 8

MREs

New objective mode is cool, and new maps and weapons help give this warhorse new life.

C-RATIONs

Some weapons are too silly, and there's still no easy way to shoot down planes.

$29, www.eagames.com

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Chaser

You think acid rain is bad? How about bullet rain?

A hearty welcome from the Chamber of Commerce: "Welcome to Montack City—Still Safer than Iraq!"

Brutal, relentless, and loud as hell, *Chaser* is a crash course in first-person shooters. Nearly every level comes at you like the most sadistic Catholic school nun on campus, spraying gunfire from every direction as you scramble for cover. Every time you turn a blind corner, every time you run down a corridor without checking behind every single obstruction, you can bet your Britney Spears tickets there's a goon lying in wait ready to pop a cap in your ass. One bullet can wipe out half your armor—another can end your life.

Chaser begins the way most sci-fi shooters end, with a desperate escape aboard a space station that's about to self-destruct. You wake up in a strange orbiting laboratory with no memory of who you are. Except for the occasional vague flashback, you'll remain in the dark about your true identity as you tangle with the Mafia and the Yakuza, and blast your way through a snowy Russian gulag (where we think we might have accidentally killed Solid Snake). Eventually you'll head to a colony on Mars to find out who you are and why your name makes people dash for their weapons.

You'll rarely notice the economy of *Chaser's* design (for instance, futuristic Yakuza wear almost identical *Battlestar Galactica* outfits, which is actually far less weird than seeing the same two face models on scores of enemies). Instead, you'll be amazed at the huge levels littered with detailed rubble (rendered by a proprietary engine called CloakNT). Game reloads are almost instantaneous, so you'll spend less time cursing the game and more time cursing yourself for obsessing about the sniper above the skylight without watching your flank. The AI is passable; enemies take cover effectively, but won't coordinate their actions. Still, their disorganization is easily made up for by their sheer numbers and hostility.

Multiplayer is included, but the real meat of *Chaser* is in the chaos and testosterone overdrive of the single-player campaign. *Chaser* is smarter, more fun, and less laborious than the *Soldier of Fortune* series. If you don't need to see shards of femur protruding from the stump of some guy's leg after he's been shot, hunt down this one.

—LOGAN DECKER

MAXIMUM PC VERDICT 8

+ CHASED

Almost nonstop action throughout, lovely graphics and lighting, and a psycho's toy box of weapons.

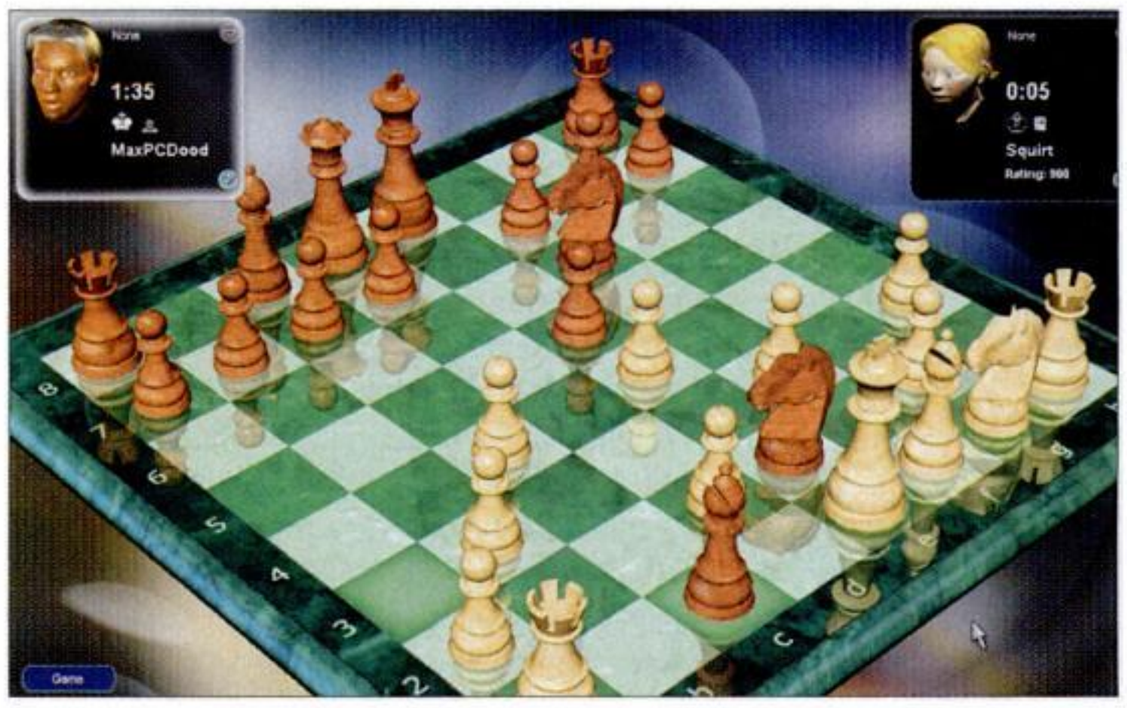
– CHASTE

Smarter cooperative AI would have been better. There's no lean feature to look around corners.

$40, www.chasergame.com

Hoyle Majestic Chess

Chess for the adventurous types



We hoped Squirt would take it easy on us, but he/she/it showed no mercy.

In the interest of full disclosure, we'll confess we're not chess aficionados. None of us were child prodigies like Bobby Fischer—although we did beat up kids like him. Still, what attracted us to *Majestic Chess* was the inclusion of a "chess adventure" in which we could play chess "while traveling through mysterious lands where you encounter challenges and enemies!"

Hmmm... sounds a little like *Warcraft* on a chess board, right? Well, not quite.

To its credit, this "chess adventure" makes learning chess fun *and* interesting. The adventure takes place over the course of eight campaigns, during which you learn about chess and are quizzed on what you know in order to earn various chess pieces. With these pieces, you then play mini-skirmishes against computer opponents to unlock new campaigns. The learning curve is a bit too steep, as the campaigns become very difficult quite early in the adventure. But by the time you finish all eight chapters, you should be a chess whiz with a thorough understanding of advanced chess tactics such as the Chewbacca Defense and the ol' Shock and Pawn.

Once you finish the adventure, *Majestic Chess* offers single-player tutorials, matches against computer opponents of varying ability, multiplayer Internet matches, and a Pocket PC version. The online interface is superb. We connected to a match in about three minutes on our first try—and were checkmated a minute later—but navigation was a breeze. Our only complaint with net-play is that the opponent listing doesn't indicate who's currently in a match, or what his or her skill level is, so you have to just go down the list issuing challenges until you find another willing and able chess buff.

Majestic Chess requires Direct X 8.1. We experienced a little lag from time to time, but we had all the game's video options—specular highlights, reflections, four light sources, and antialiasing—cranked to the max on our 3D chess board (it can be toggled between 2D and 3D). Overall, *Majestic Chess* surprised us by being both entertaining and innovative. Our minor complaints are just that: minor.

—JOSH NOREM

MAXIMUM PC VERDICT 9

+ KASPAROV

The adventure aspect actually makes chess fun.

– DEEP BLUE

Adventure becomes too difficult early on, and there's occasional lag.

$30, www.majesticchess.com

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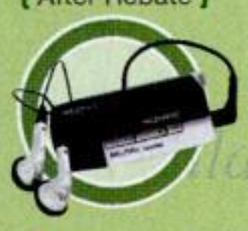

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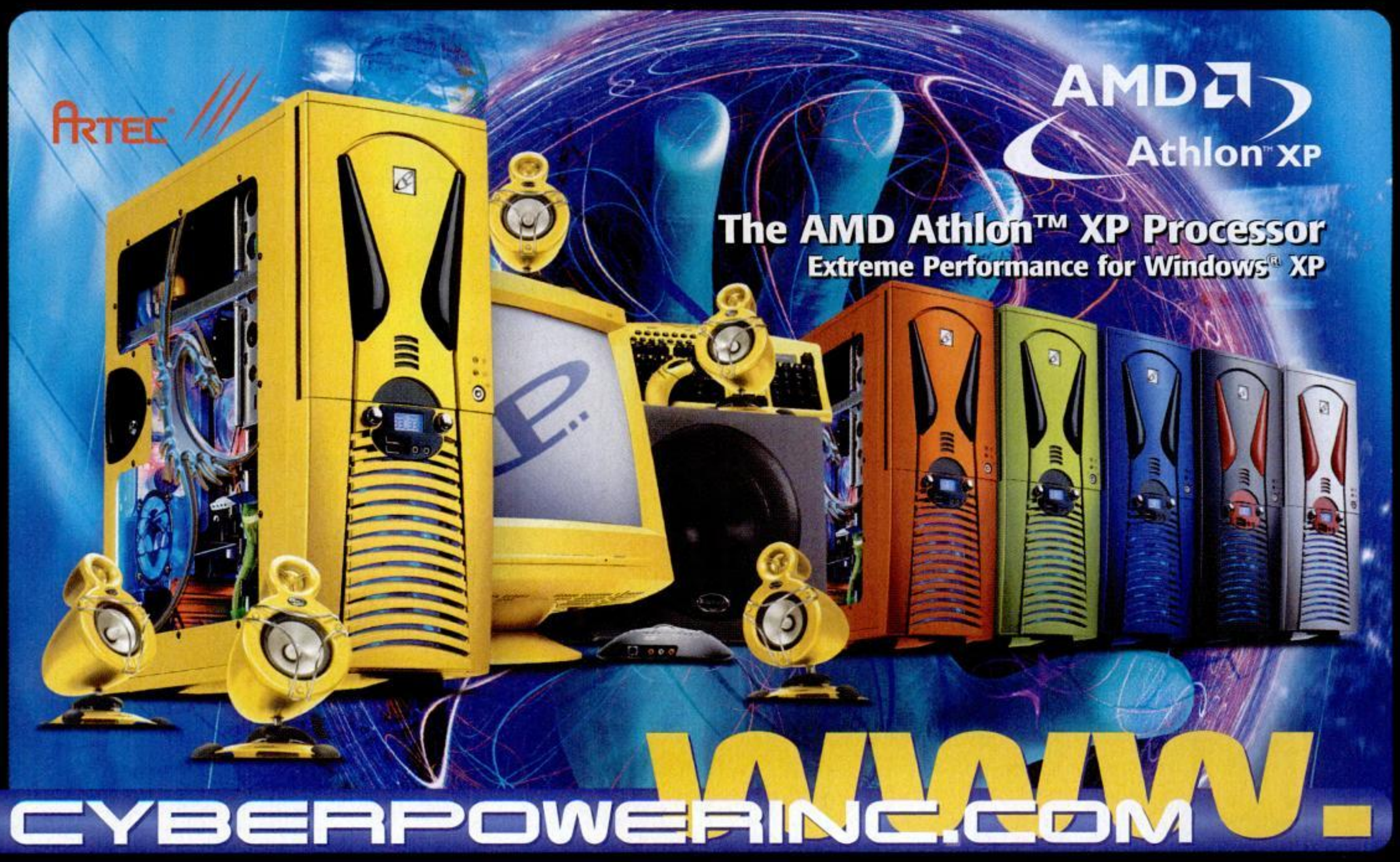

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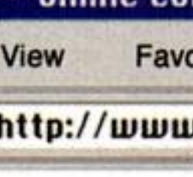

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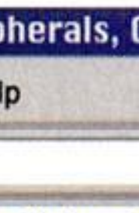

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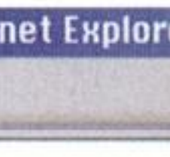

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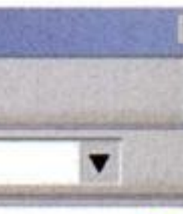

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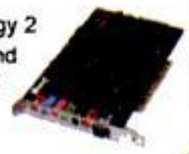

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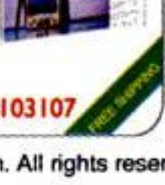

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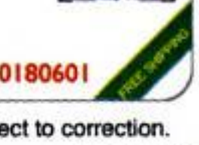

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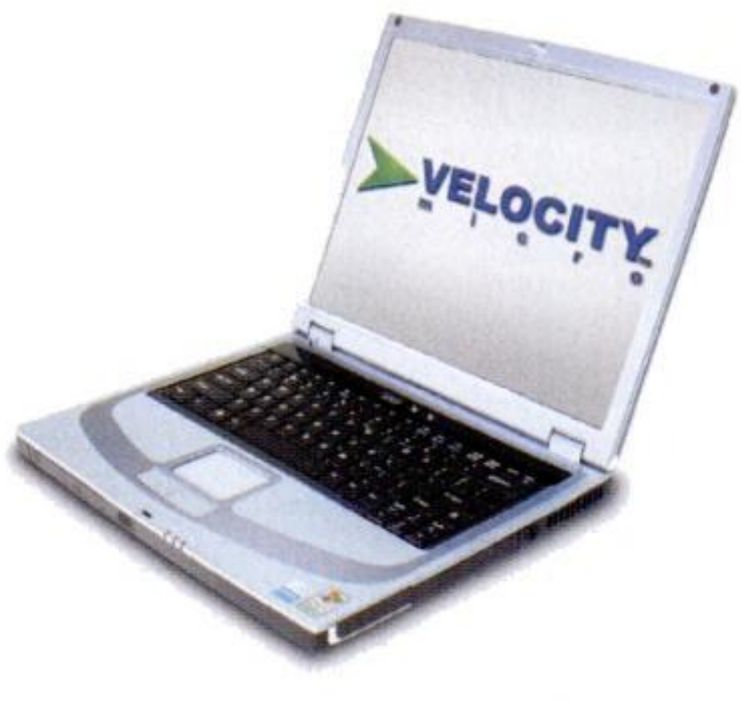

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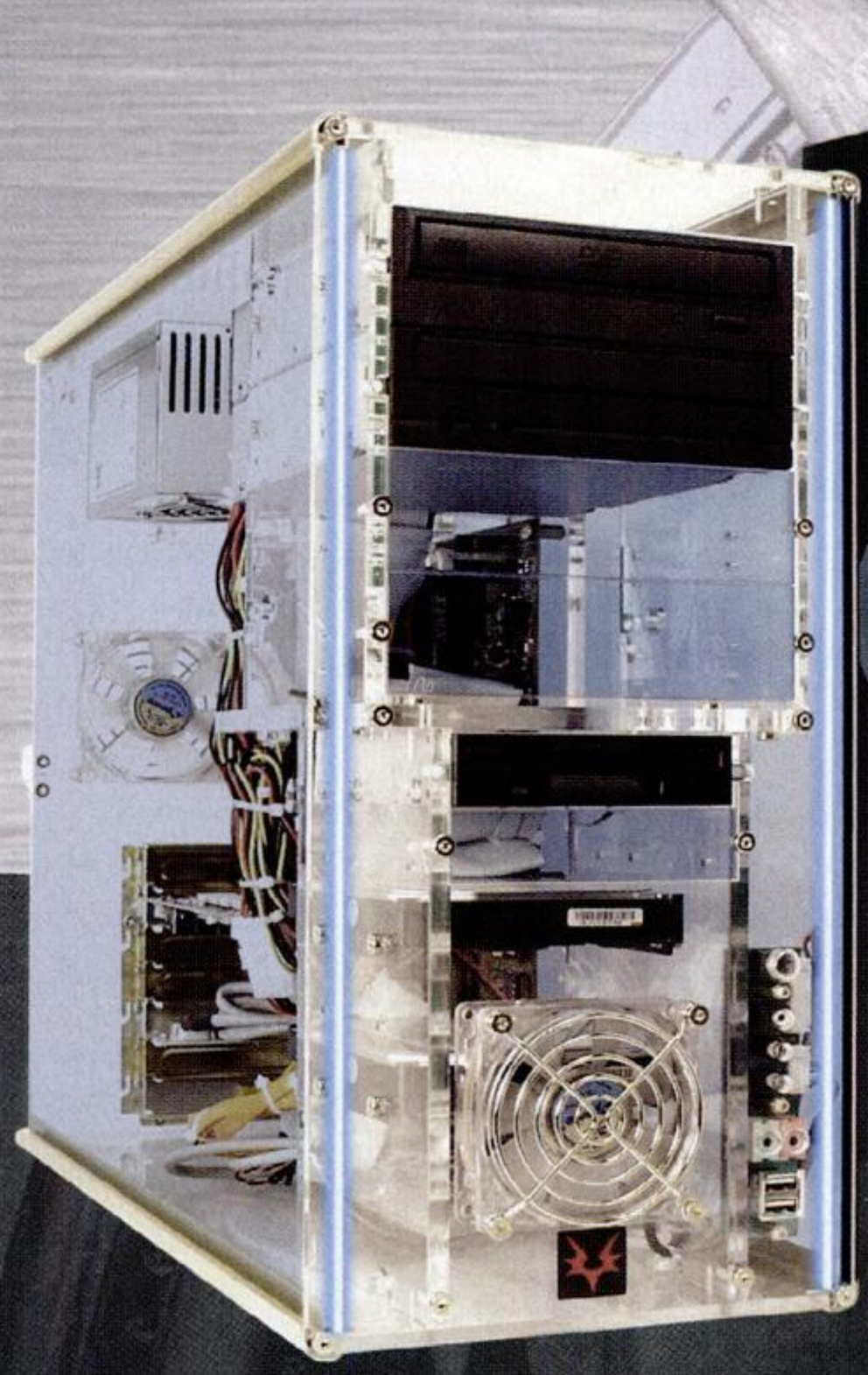

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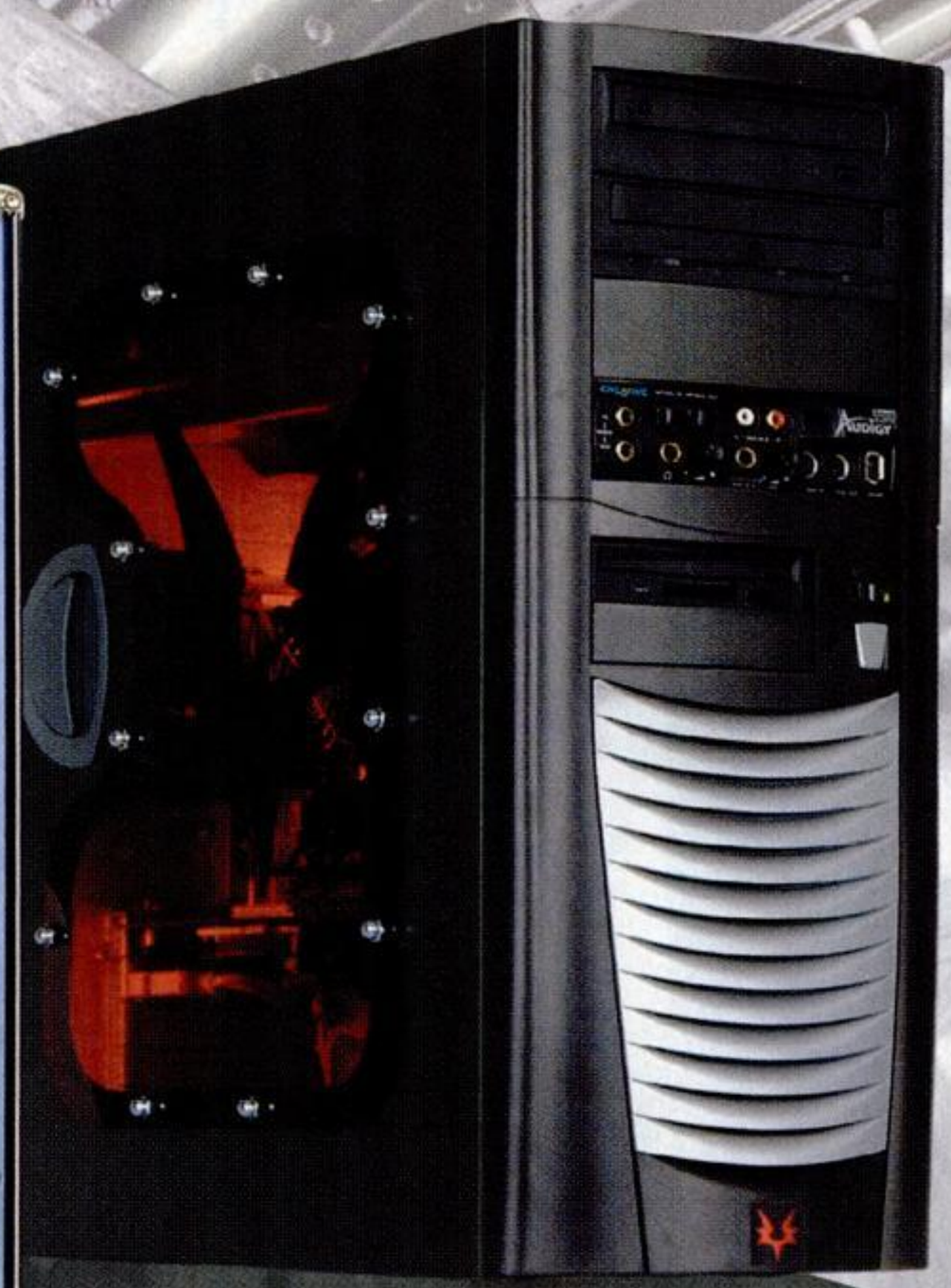

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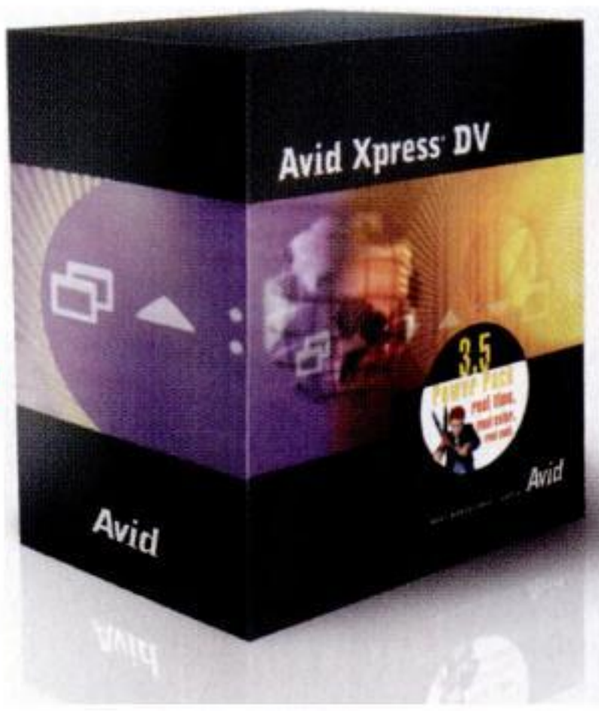

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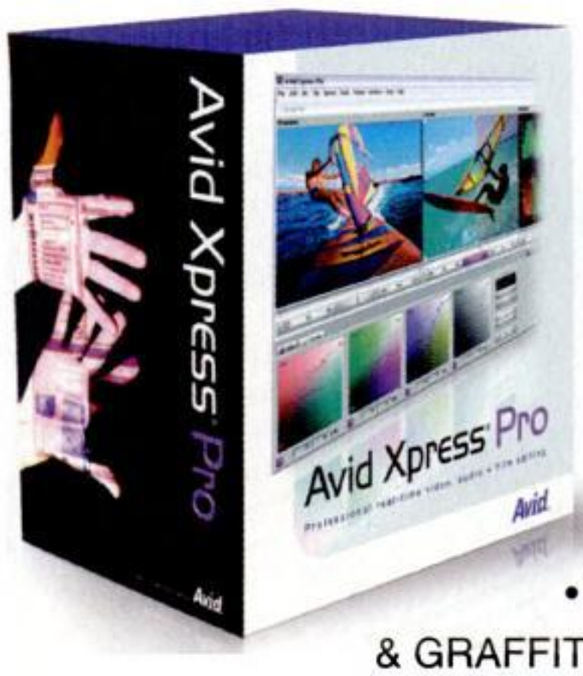

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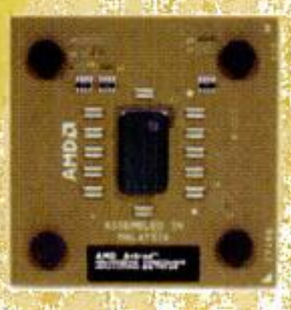

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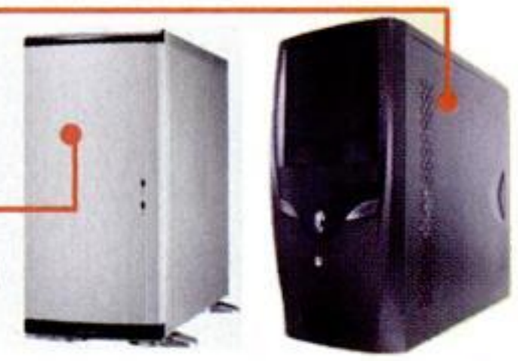

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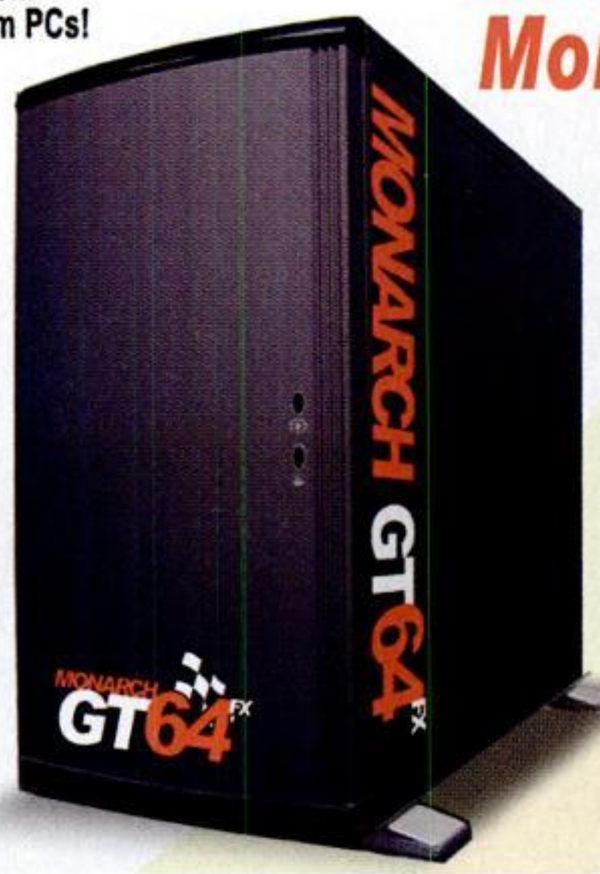

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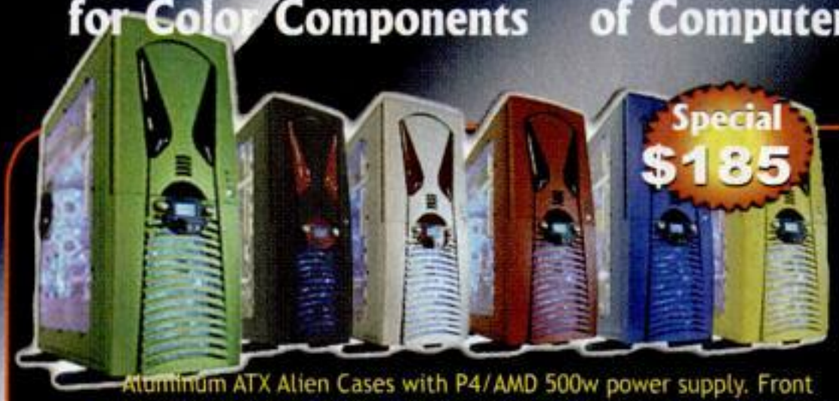

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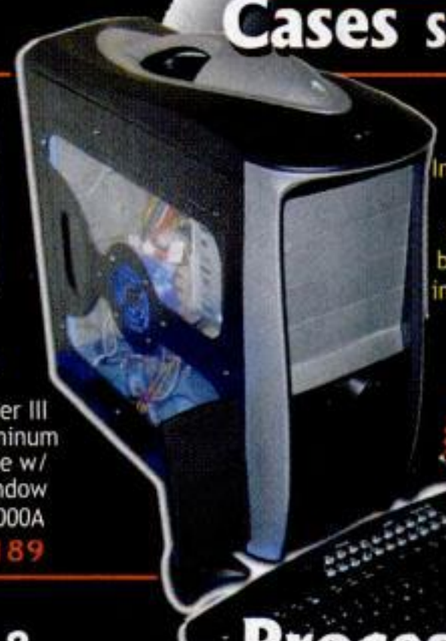

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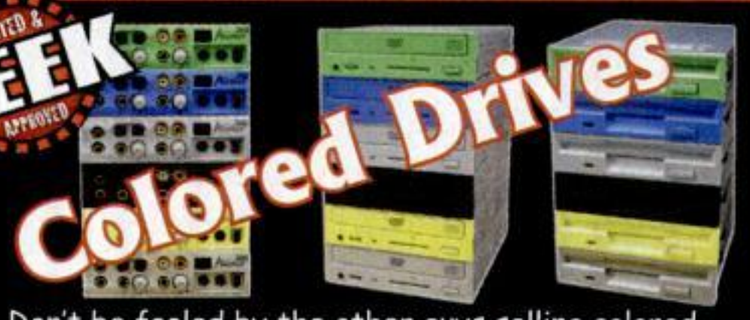

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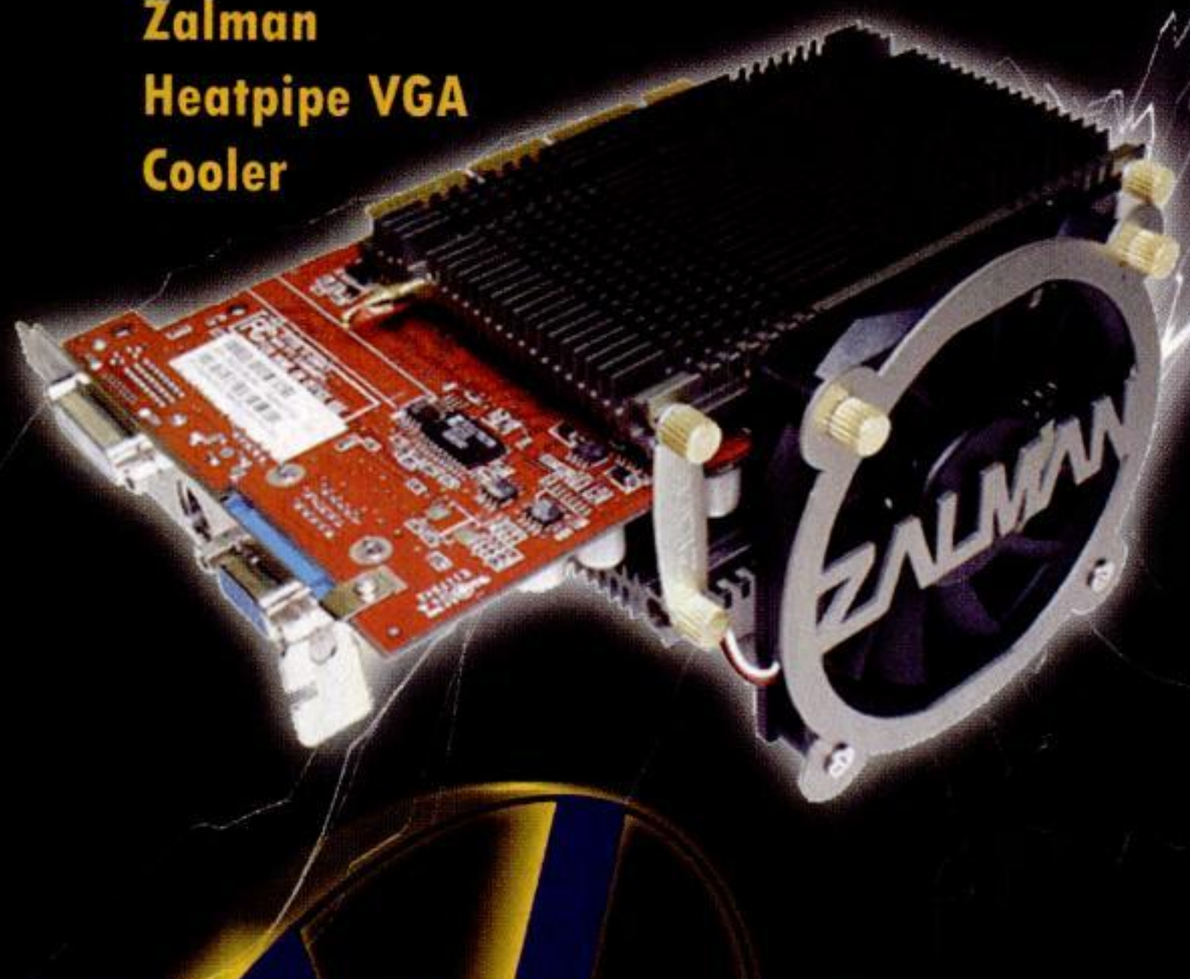

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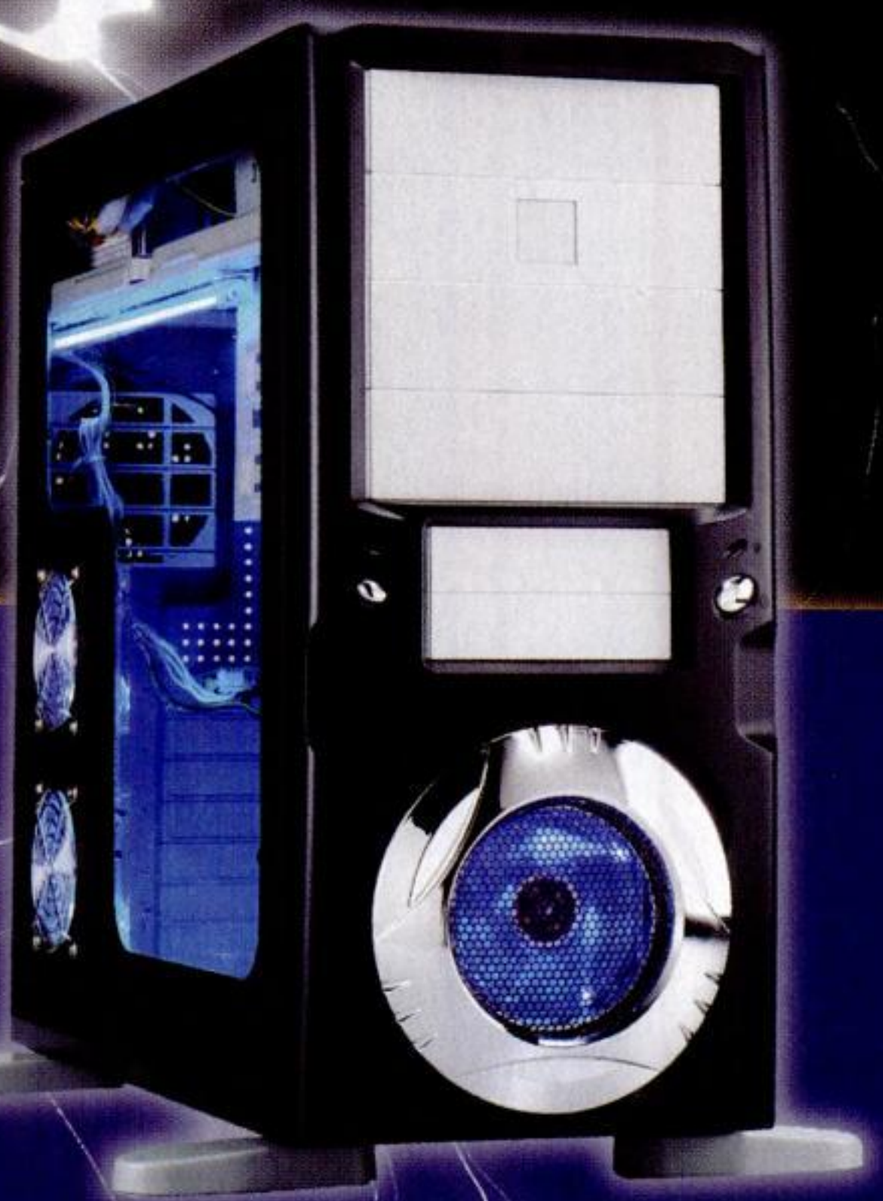

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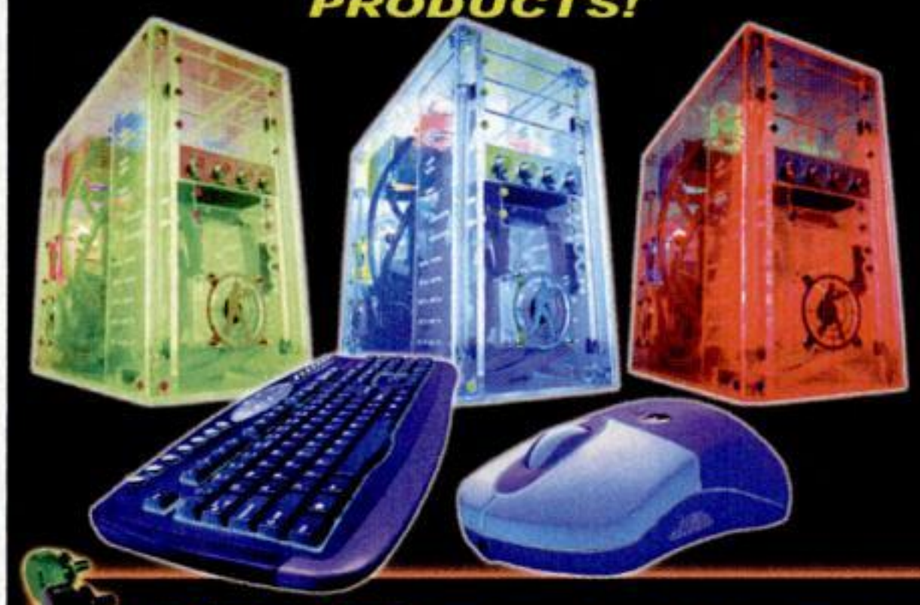

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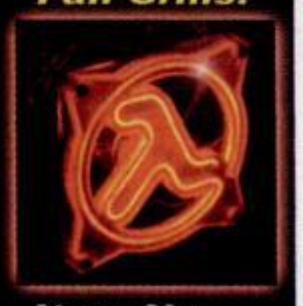

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TO ENTER: Your submission packet must contain your name, street address, and daytime phone number; no fewer than three high-res JPEGs (minimum size 1024x768) of your modified PC; and a 300-word description of what your PC represents and how it was modified. E-mailed submissions should be sent to **rig@maximumpc.com.** Snail mail submissions should be sent to Rig of the Month, c/o Maximum PC, 150 North Hill Drive, Suite 40, Brisbane, CA, 94005.

The judges will be *Maximum PC* editors, and they will base their decision on the following criteria: creativity and craftsmanship.

One entry per household. Your contest entry will be valid until (1) six months after its submission or (2) May 1, 2004, whichever date is earlier. Each month a winner will be chosen from the existing pool of valid entries, and featured in the Rig of the Month department of the magazine. The final winner in this contest will be announced in the July 2004 issue. Each of the judging criteria (creativity and craftsmanship) will be weighed equally at 50 percent. By entering this contest you agree that Future Network USA, Inc. may use your name, likeness, and web site for promotional purposes without further payment. All prizes will be awarded and no minimum number of entries is required. Prizes won by minors will be awarded to their parents or legal guardians. Future Network USA is not responsible for damages or expenses that the winners might incur as a result of the Contest or the receipt of a prize, and winners are responsible for income taxes based on the value of the prize received. A list of winners may also be obtained by sending a stamped, self-addressed envelope to Future Network USA, Inc., c/o Rig of the Month, 150 North Hill Drive, Brisbane, CA 94005. This contest is limited to residents of the United States. No purchase necessary; void in Arizona, Maryland, Vermont, Puerto Rico, and where prohibited by law.

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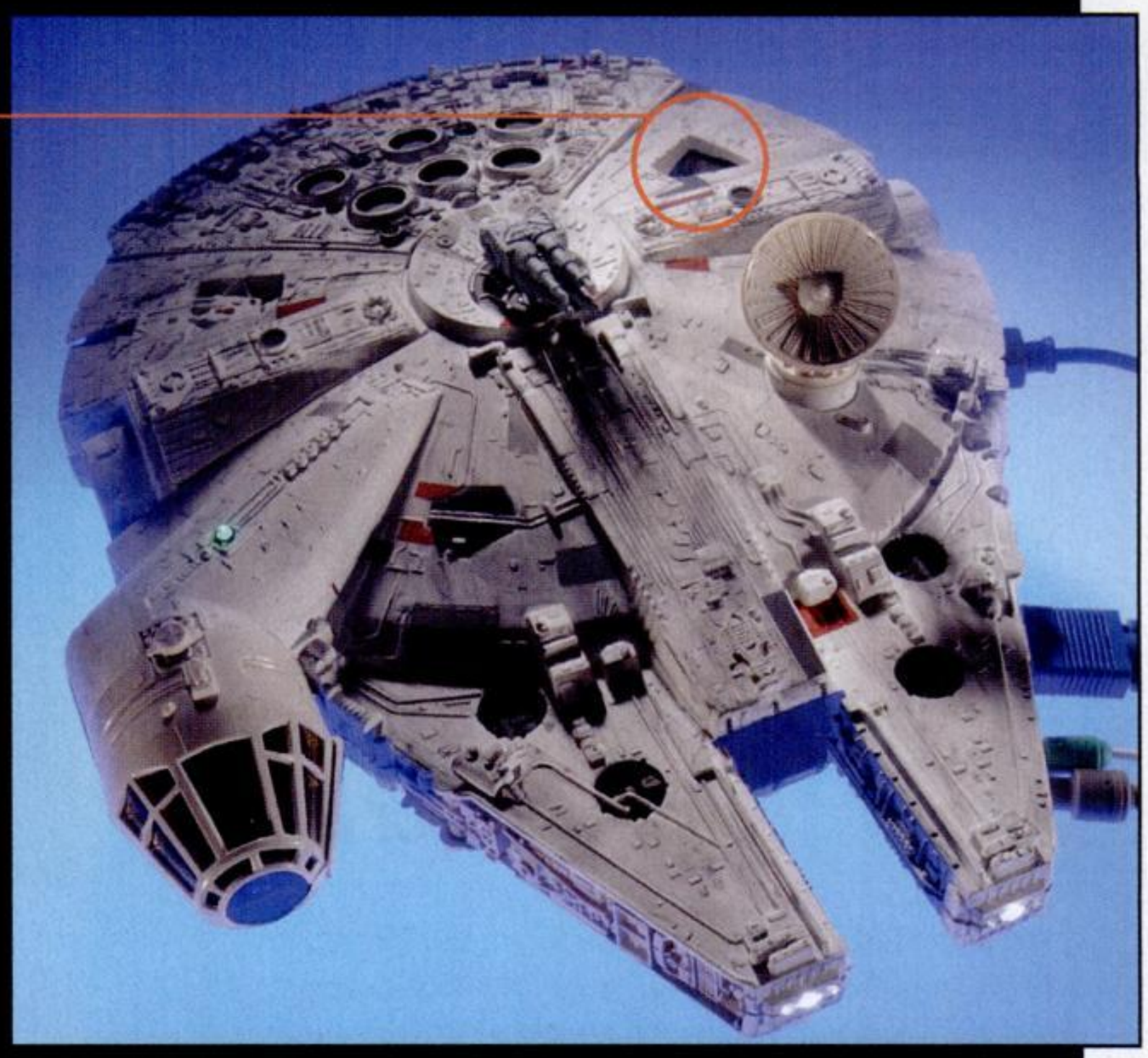
Say what you will about *Star Wars* fans, they sure find some inventive ways to pay tribute to their favorite franchise (shoot, our own Gordon Mah Ung had *Star Wars* music playing at his wedding!). Russ Caslis pays his respects with a fully functioning computer that's been painstakingly stuffed into a small-scale model of Han Solo's famed freighter.

Caslis was familiar with said model, having owned one as a child, but as he puts it: "After finding one on Ebay and having it arrive, I realized that either the toy shrunk or I grew... Many hours were spent simply looking at the toy and trying to figure out how to fit everything inside and where all the connections would be."

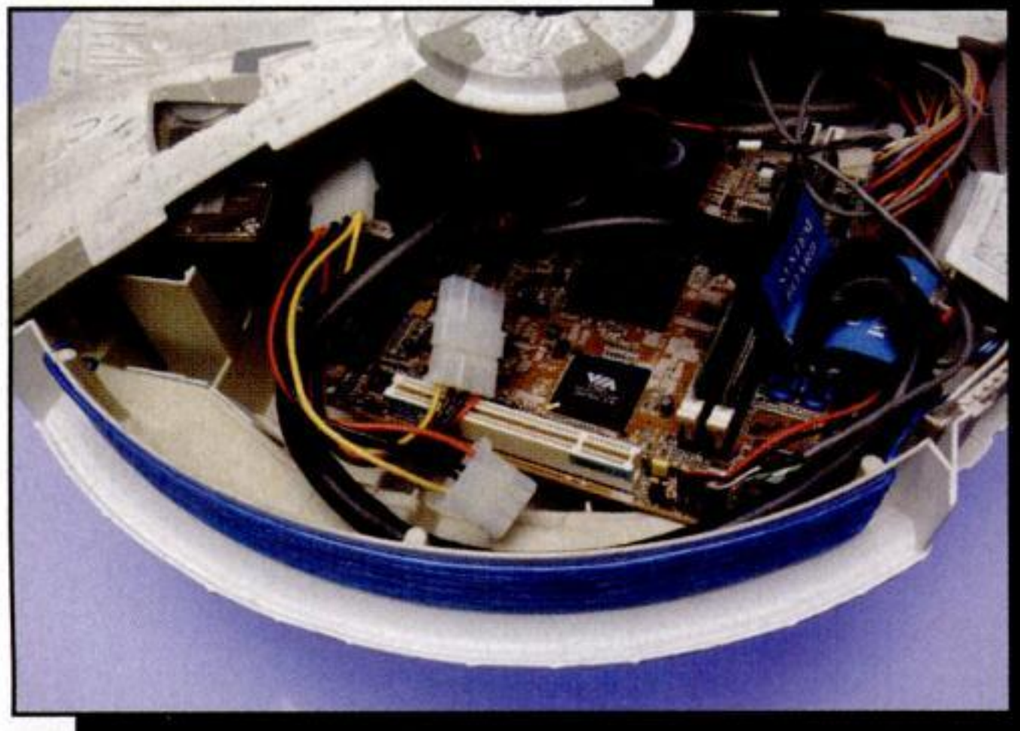
We're here to say, he did it!

THIS MONTH: Russ Caslis' Millennium Falcon



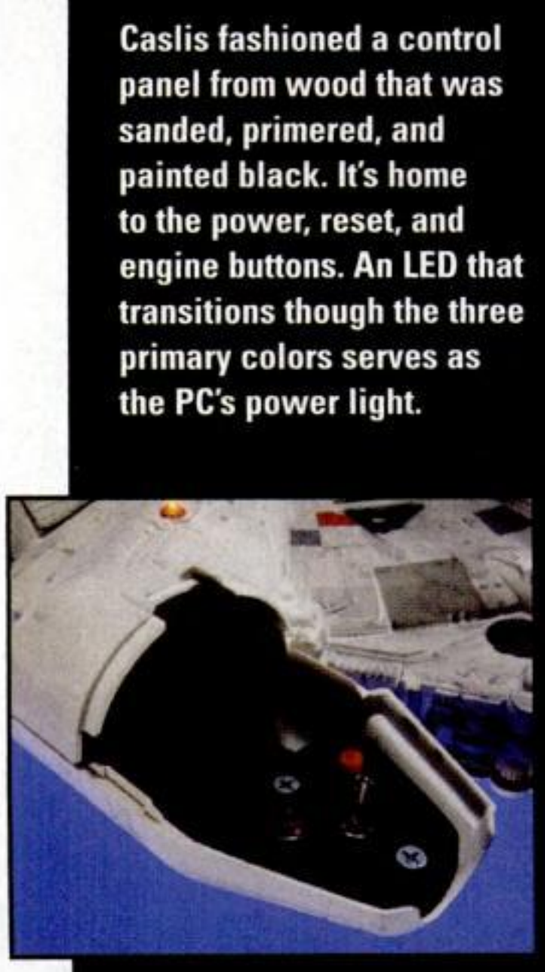
As if the project weren't challenging enough, Caslis was determined to include a window through which the internal workings of the rig's laptop hard drive could be observed.

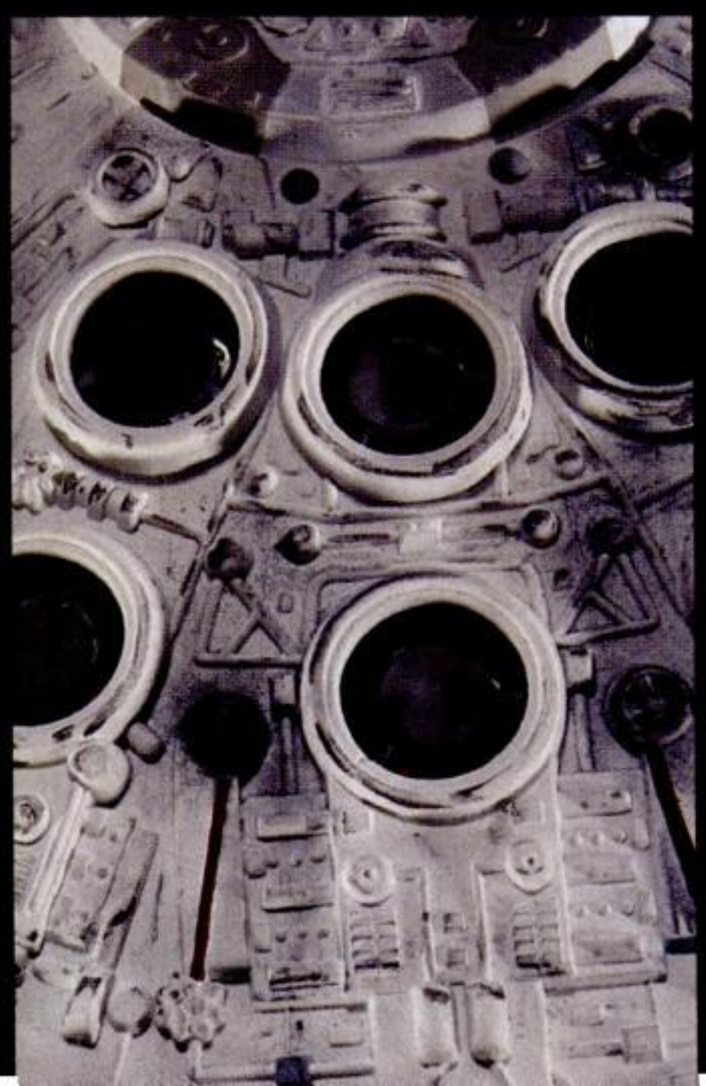
It's a tight fit, but six laptop fans glued to the underneath of the ship's back cover keep these close quarters cool.



Blue electroluminescent wires adorn the engine bay. The ships ultra-bright white "headlights" indicate hard drive activity.

Caslis fashioned a control panel from wood that was sanded, primered, and painted black. It's home to the power, reset, and engine buttons. An LED that transitions though the three primary colors serves as the PC's power light.





Every aspect of the craft was painted to resemble the real Millennium, even down to the burn marks, which Caslis applied using charcoal.

For his winning entry Russ Caslis wins $1,000 and a case of BAWLS to fuel his late nights of modding. You can win too! See previous page for contest details.

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